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LIVER HEMOSTASIS

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A REVIEW of the methods for the control of liver hemorrhage attests to the ingenuity, skill, and courage of the earlier surgeons who have made operations on the liver safe. In presenting this review on the subject of liver hemostasis, it is our desire to give a brief review of the history of its progress and to show the evolution of the various methods employed. Priority is often difficult to establish and will not be stressed.

A number of methods for hemostasis have been suggested, some of which have been used successfully both in the experimental animal as well as in the human being. Others are more or less complicated and cannot be employed in practice without special preparation. No single method will be found applicable in all cases and it is for this reason that a review of the subject seems indicated. All general surgeons should be familiar with the proved techniques available for use in control of bleeding from liver injuries as well as that occurring from resection of tumors of this organ.

The feasibility of operating upon the liver has been repeatedly demonstrated. As noted by Brunschwig (10), more than 500 instances of excision of hepatic neoplasms are recorded in the literature. In 1951, Altman (1) reported that the left lobe of the liver had been removed on 68 previous occasions for hemangiomas alone.

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The original objections to resection of large segments of the liver were the severe hemorrhages associated with such surgery, infection, and the fear that function of the liver would be impaired following excision of more than a small amount of liver tissue. Inasmuch as the human liver is sterile, the problem of infection is of no greater concern than that with surgery on other abdominal organs (45). The accumulation of experimental and clinical knowledge of hepatic surgery, now that a number of right as well as left hepatolobectomies have been carried out successfully, indicates that an individual may survive with a small amount of normal liver parenchyma. Fishback demonstrated that from 65 to 75 per cent of the liver of the experimental animal could be removed with survival and noted that no other organ in the body remotely approached the liver in its capacity for regeneration (19).

The blood coming to the liver is unequally divided between the portal vein, supplying approximately 70 per cent, and the hepatic artery, 30 per cent. The portal vein takes its origin in the splanchnic bed and delivers its blood to the liver under low pressure (8 to 10 mm. of mercury), while that from the hepatic artery reaches the liver directly from the aorta and arrives under a pressure equal to the systemic arterial pressure. Immediately upon entering the liver, the main portal vein divides into two primary trunks. These, in turn, branch and enter the portal

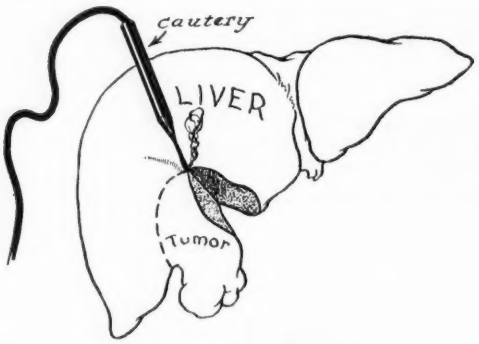

PLATE A. *Thermic method. 1.* Simple cautery.

triads, from which the blood drains into the hepatic veins (left, middle, right, plus additional minor veins) and then into the inferior vena cava. It is generally stated that the right trunk supplies the right lobe of the liver while the left one supplies the left lobe. This concept is not completely correct for it has been demonstrated that these main trunks supply areas of hepatic tissue which do not conform exactly to the various lobes of the liver. Studies are available which show a rather free anastomosis between the right and left lobes of the liver. This free anastomosis favors survival following extensive resection in case either branch of the hepatic artery is divided (18).

The following is an enumeration of most methods of liver hemostasis which have been tried; many are of only academic interest. A discussion of some of the advantages and disadvantages accruing to each will be presented.

METHODS OF LIVER HEMOSTASIS

1. Thermic
   a. The Paquelin cautery
   b. Hot water and steam
   c. Hot air
   d. Coagulation obtained by use of the soldering iron
2. Tourniquets and clamps
   a. Silk
   b. Rubber
   c. Gauze
   d. Clamps
3. Suture techniques
   a. Suture alone
   b. Suture with prostheses
      1. Chicken bone
      2. Whale bone
      3. Scapula of calf
      4. Magnesium
      5. Celluloid
      6. Needles
      7. Cartilage
      8. Preserved flaps of intestine and bladder wall
      9. Muscle from the pigeon or rabbit
   c. Suture after making troughs (edge to edge or "fish mouth method")
4. Topical agents
   a. Tamponades
      1. Gauze
         a. Plain
         b. Iodiform
      2. Sterilized marine sponge
   b. Rubber bag
   c. Coagulum techniques
      1. Sano
      2. Antipyrine
      3. Adrenalin
      4. Oil of turpentine
      5. Perchloride of iron
      6. Calcium chloride
      7. Thrombin, gelatin, and fibrin
   d. Absorbable hemostatic agents
      1. Oxycel
      2. Gelfoam
   e. Grafts (autogenous)
      1. Fascia lata
      2. Omentum
      3. Muscle
         a. Seromuscular flaps
         b. Aponeurotic muscular flaps
         c. Seromuscular aponeurotic
      4. Skin
      5. Diaphragm
      6. Free mesothelial (peritoneum)–Author's method
      7. Gut segment transplants
5. Controlled hemostasis
   a. Right hepatolobectomy
   b. Left hepatolobectomy

The electric current has been extensively used for cutting as well as coagulating purposes in the control of diffuse parenchymatous hemorrhage occurring from the liver, either alone or in combination with other methods (41, 51)(Plate A). The disadvantages of electrocoagulation are the eschars produced and the failure of the cautery to control bleeding from the larger vessels. The eschars make it difficult to isolate the individual bleeding points, and the slough which occurs in

the large areas involved may be followed by persistent biliary drainage or secondary hemorrhage. Similar objections apply to Snegirew's (49) steam spray and Hollander's (25) hot air methods, for they also cause necrosis and are not effective against the large bleeding vessels which constitute the major problem in liver hemostasis. Coagulation for the control of bleeding when removing a hemangioma of the liver has been successfully carried out by Graham (23) with heat obtained from a soldering iron. Reid (41) found that the use of hemostatic sutures, placed before section of the liver was started, arrested most of the bleeding, so that a minimum of coagulation of the surface was necessary for control of the parenchymal ooze. This method leaves the least possible eschar to slough before healing, and Reid believed it a worthwhile combination.

A second method of liver hemorrhage control is by use of tourniquets or clamps (plate B). A variety of tourniquets including silk, rubber, and

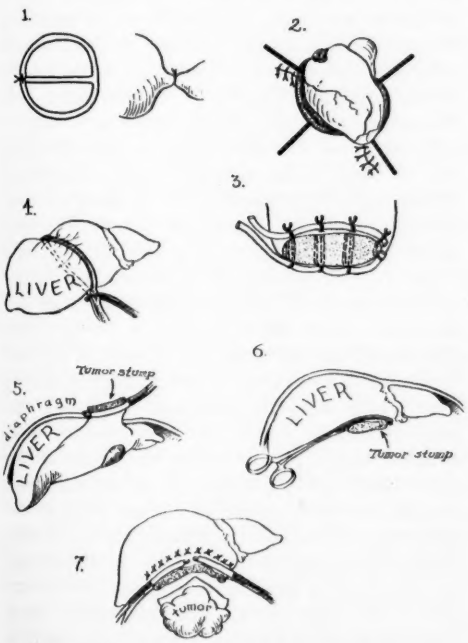

PLATE B. *Tourniquet and clamp methods. 1.* Silk ligature used as a constrictor. *2.* Transfixion pins holding elastic ligature. *3.* Rubber tubes held by sutures. *4.* Temporary liver compression using gauze or Penrose rubber drain. *5.* Tumor stump exteriorized. *6.* Clamp handles exteriorized after tumor removed. *7.* Temporary clamp compression of liver edges while placing permanent hemostatic sutures.

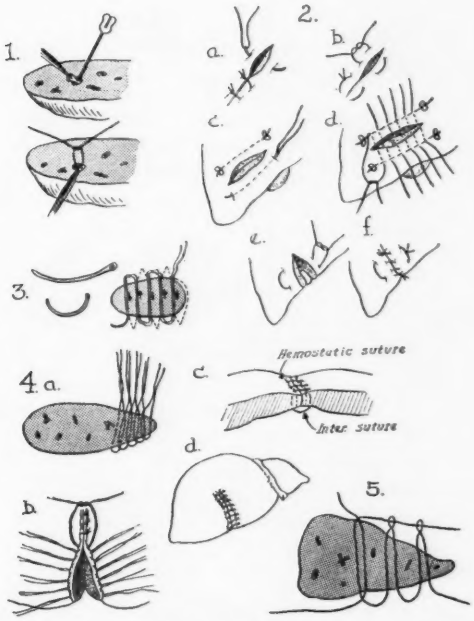

PLATE C. *Suture methods. 1.* Mobilization and ligation of vessels on cut surface of liver. *2. a* and *b*: Methods of suture for lacerations of liver surface. *c* and *d*: Sunken catgut sutures placed using transverse sutures for approximation. *e* and *f*: Through-and-through sutures of liver margin. *3.* Kousnetzoff and Penski needles (blunt) with mattress sutures (double strand). *4.* a: Mattress overlapping sutures. b: Mattress sutures tied across wound. c and d: Similar type mattress suture with coaptation sutures placed. *5.* Compression sutures (Auvray's method using single strand).

gauze have been utilized (14, 16, 25, 27, 48). On occasions these were held in place by transfixion pins passed through the liver (16). In some cases the liver lobe containing the tumor was exteriorized after the constrictor had been applied. This method, of course, has obvious disadvantages. Infection, the impossibility of exteriorizing all tumors, and the necessity of leaving the wound open when exteriorization is impossible are three of the more apparent ones. Israel (27) used the elastic ligature as a temporary constrictor and treated the stump intraperitoneally, which obviated some of the disadvantages associated with extraperitonealization. The introduction in surgery of the rubber-covered clamp and its application to the liver edges proved to be helpful in controlling surface ooze while the individual bleeders were being isolated, mobilized, and

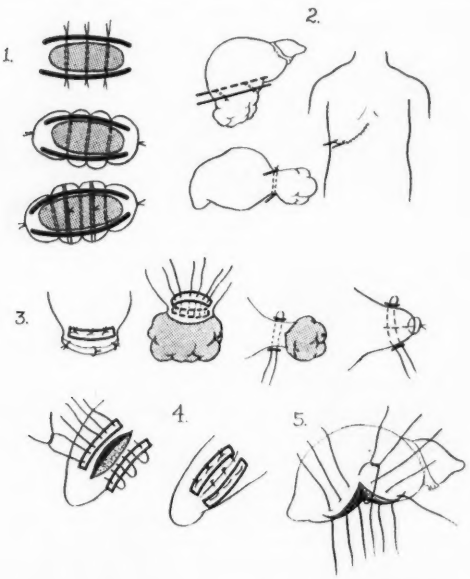

PLATE D. *Suture methods (continued).* *1.* Plates or fascia strips through which sutures are passed to prevent cutting of liver substance. *2.* Mattress needles held by catgut loops passing through the liver. *3* and *4.* Coaptation of liver tissue using plates or fascia after tumor excision or repair of lacerations. *5.* Trough, or fish mouth, method of Frank.

ligated (14,25,41). Tourniquets as well as clamps will, in most instances, be found unnecessary because of the availability of simpler and more effective methods, but they may be useful.

The third method is one in which sutures play the dominant part. A variety of methods for suturing are available (Plate C & D). Various forms of through-and-through sutures without other supporting materials have been used since the earliest liver resections and are still an important method of hemorrhage control from the liver. Kousnetzoff and Penski (29) demonstrated that the vessels in the human liver are no less resistant than arteries and veins of similar caliber in other organs of the body. Auvray (3) confirmed their results and demonstrated that because of the elasticity of the vessels they could be drawn from the cut surface of the liver to the extent of 1 centimeter. In sectioning the liver, one of the problems presented is the frequency with which large veins are opened in an oblique fashion which makes it difficult to apply forceps and even more difficult to apply ligatures because ligatures slip easily. Under such circumstances a suture passed through the vessel wall, which has greater tensile strength than that of the liver parenchyma proper, will make vessel closure easier. Garre (22), in 1907, discussed the suture material that is most adaptable to liver surgery. The majority of surgeons today subscribe to his principles. As to the type of suture material, catgut is preferred; however, some surgeons prefer silk of fine caliber, believing that the latter swells less and is, therefore, less likely to slip. The majority of workers, however, when using through-and-through liver sutures for hemostatic purposes prefer catgut of larger caliber. Kousnetzoff and Penski (29) introduced a method of suturing which was a decided improvement upon all methods in use prior to their report in 1896. They placed great stress upon the importance of using a blunt needle (Collins type) which, they felt, prevented injury to the liver vessels. This needle, armed with a double thread, was passed back and forth through the liver some distance above the line of resection, the threads being left slack between the points of insertion. These threads were cut and the ends tied to produce gentle pressure and thus control the hemorrhage. This amounted to a U-shaped mattress type of suture. Following this, the individual vessels that bled were circumstitched. A number of modifications of Kousnetzoff's original suture method were introduced over the years, but none have been shown to be more effective than that described by him (44). A problem which often arises during suture of the liver is the cutting-in of the suture material through the fragile hepatic tissue. To reduce the likelihood of this occurrence, a number of prostheses have been recommended. Chicken bone, whale bone, the scapula of a calf, cartilage, preserved flaps of intestine and bladder wall, muscle from the pigeon and rabbit, sheets of catgut, boiled tendon, strips of metal, celluloid, needles, and magnesium plates are some of the prostheses which have been used (13, 30, 40, 51). These prostheses were placed on the upper and lower surface of the liver and then sutures were passed through them. The objective, when through-and-through liver sutures were used, is preventive, and the sutures are placed in proximity to the line of liver section. This leaves a strip of hepatic tissue which is largely devascularized and may undergo necrosis; however, this has not been a major problem when this method of liver hemorrhage control has been utilized.

The number and variety of hepatic sutures indicate that each suture is limited in its usefulness and reveal that no one of them can be used in all cases. The method recommended by Frank (20), in which troughs were produced (edge to edge or fish mouth method), facilitates closure with sutures alone and is useful for injuries and tumors involving the liver edge.

A variety of topical agents has been used throughout the years, and Mikulicz (36) is credited with being the first to recommend the use of the free gauze pack as a hemostatic agent for liver hemorrhage (Plate E). Kousnetzoff and Penski were the first to suggest the use of a retained gauze pack which is held in place with sutures placed in the liver edges overlying the pack proper. Wilms (55) used a warm wet pack for the same purpose, and others have recommended adrenalin solution (1 to 1,000 and 1 to 10,000) applied by means of the pack for similar hemostatic purposes. Packing of the bleeding liver is usually considered in the treatment of wounds of this organ when its use can be combined advantageously with other methods. The plain gauze pack will afford considerable assistance when used as a temporary measure and presents the advantage of its availability. The iodiform pack, however, should never be used because of the possibility of iodiform poisoning (50). Tamponade with sterilized marine sponge was used experimentally but soon abandoned (30). Tamponade as a method should be discarded except for temporary purposes. It is unsatisfactory and when used is often followed by innumerable serious complications. The mortality following the use of these agents in the treatment of liver injuries has been shown to be higher than when other available methods are utilized (33). Schroeder (48) and others (9, 35) devised a drainage tube and inflated rubber bag arrangement for liver hemostasis. On occasion, in conjunction with the bag, a styptic was used; it consisted of gum acacia in which 2 per cent Lugol's solution was incorporated. In 1943, Sano (47) devised a coagulum method of skin grafting which consisted in the use of a cell extract plus plasma. When the mixture was applied, it brought about adherence of the graft to the recipient area. Babcock (4) extended this method of treatment to liver injuries and thought that it had real merit in the treatment of these conditions. Other topical coagulating substances were used, such as antipyrine, perchloride of iron,

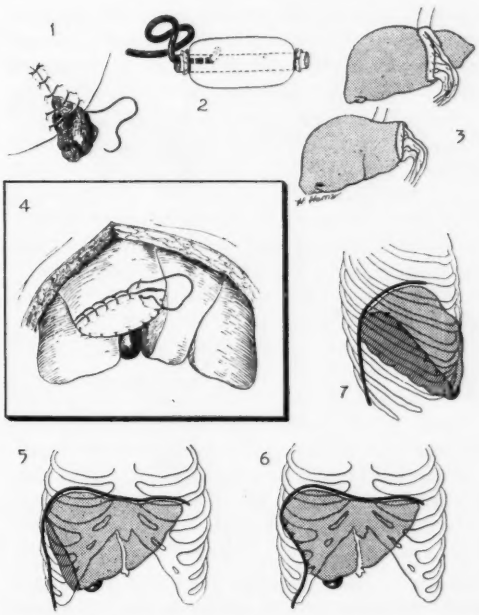

PLATE E. *Topical agents. 1.* Pack and suture method (gauze or absorbable hemostatics). *2.* Pressure and drainage device (used with or without styptic). *3.* Viable intestinal segments. *4.* Autogenous graft (using mesothelial or dermal grafts). *5, 6,* and *7.* Diaphragm sutured to liver wound edges.

calcium chloride, oil of turpentine, thrombin, gelatin, and fibrin, but none of these found acceptance (30). In recent years the use of absorbable hemostatics (gelfoam and oxycel) has come into favor and has been resorted to rather widely in liver surgery (21, 42, 53). These hemostatics undoubtedly have merit, although there are a number of reported cases in which complications followed their intra-abdominal use (12, 17, 28, 33, 52). Beck (6) devised a method of hemostasis in which he took, from each border of the abdominal incision, a broad band including peritoneum, fascia and muscle, leaving one end attached. The free end of the strip was laid around the liver edge and sutures were passed through it and drawn tightly. Seromuscular and aponeurotic muscular flaps have also been utilized in a similar fashion (5, 30). Snegirew (49) sutured omentum over the liver wound for hemostasis but thought that this method was unsatisfactory because of the insufficient firmness of the material employed. It has been our experience, both experimental and clinical, (and this has been con-

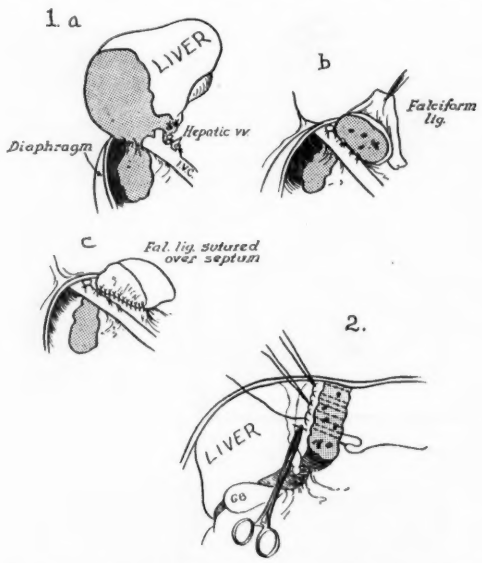

PLATE F. *Controlled hemostasis. 1, a, b,* and *c*: Controlled type hepatolobectomy. *2.* Guillotine type of hepatolobectomy.

firmed by others) that the insertion of a small piece of omentum beneath the sutures when carrying out small liver resections will simplify obtaining satisfactory hemostasis.[1] Lanzillo (30), in a case report, recommended the use of the diaphragm as a method of covering a large raw liver surface following trauma (Plate E Figs. 5, 6, and 7). The intact diaphragm was sutured to an irregular liver surface from which a large fragment of liver substance had been detached following a liver injury. This worker expressed the hope that the method outlined by him would prove to be efficacious in the care of injuries of the liver in which a vast loss of liver substance had occurred and also produce efficient hemostasis in more or less extensive partial hepatectomies. A recent experimental method of peritonealizing the liver made use of viable intestinal segments divested of their mucosa (24) (Plate E Fig. 3).

In 1954, Masters *et al.* (34) reported their experience in controlling liver hemorrhage by use of the split thickness skin graft. Clinically, they noted that bleeding from a raw granulating surface could be readily controlled by a split thickness skin covering. Accordingly, they applied this knowledge to liver surgery, believing that the application of split thickness grafts to wounds of the liver simplified surgery of this organ. They undertook a series of animal experiments to determine the effectiveness of these grafts in controlling liver hemorrhage, both from the traumatic as well as resective standpoints. They concluded that an acute liver hemorrhage from a resected surface of the liver or from the experimentally traumatized liver lobule could be controlled satisfactorily by means of the split thickness skin graft. In addition, they stated that not only could the hemorrhage be readily controlled but split thickness skin grafts provided an easier method of accomplishing hemostasis than other hemostatic agents then in common usage. No complications were noted from either intra-abdominal adhesions or at the abdominal donor site. The only abnormality cited in the experimental animal, after grafting, was a small cyst formation in the areas where the graft overlapped the parietal or visceral peritoneum.

The last means for the control of liver hemorrhage is the method of controlled hemostasis. If either a right or left hepatolobectomy is to be carried out, and this is being accomplished with more frequency each year, there are two methods which have proved to be successful. The first (10, 54) is one in which a vertical transection of the lobe, either to the right or left of the falciform ligament is made, a 1 or 2 centimeter layer of liver tissue being left at the base of the lobe to be resected (Plate F Fig. 2). As the liver parenchyma is cut through and the portal triads are encountered, the individual vessels are clamped, ligated, or closed by means of stick ties which pass through the vessel wall proper. The advantages accruing to this method are considerable, for one of the most difficult problems when carrying out total hepatolobectomy is the control of bleeding from the hepatic veins with the possibility of air embolism when they are open. The negative pressure on inspiration within the intrahepatic radicals of the hepatic veins has been demonstrated (53). In resecting the entire right lobe of the liver, great care must be exercised to secure the right hepatic vein prior to transection for the reasons mentioned. Brunschwig (10) leaves a small portion of liver parenchyma of the right upper lobe, adjacent to the falciform liga-

[1]Personal communication: Dr. E. Graham has controlled hemorrhage from the raw surface of the liver by pressing the omentum against the raw surface for 10 to 15 minutes with a gauze pack. He states that generally after that time it has become adherent and will ,therefore, prevent any further bleeding.

ment, in order to ligate by transfixion sutures and thus obviate the necessity of exposing the right hepatic vein proper. In carrying out total right hepatolobectomy, the gallbladder is also removed. The caudate lobe of the liver may or may not be removed when this is carried out; it has a separate group of vessels which must be controlled.

A second method of performing right or left hepatolobectomy was described in 1936 by Huard and Meyer-May (26) (Plate F Fig. 1a, b, c). It consists in ligating the artery, vein, and bile duct to the involved lobe before excision is carried out. This method reduces bleeding to an absolute minimum. The latter method has been described by Pack and Baker (38) as well as others (8, 31, 32). In removing the left liver lobe by this method, it is detached from the left leaf of the diaphragm, after which the left branches of the portal vein, the hepatic artery, and the left branch of the common bile duct are isolated and secured. Lastly, division of the left hepatic vein is carried out. In performing right hepatolobectomy by this method good exposure is obtained (38) by means of a right thoracoabdominal incision starting over the right eighth rib at its angle with division of the diphragm to the vena cava. The round and triangular ligaments of the liver are divided and the liver is retracted upward into the thorax. The cystic artery, the cystic duct, branches of the hepatic artery on the right, and the right hepatic duct are clamped, cut, and ligated. The liver is then reflected downward, forward, and to the left in order to secure and divide the right hepatic veins. The base of the right lobe of the liver is then cut through just to the right of the falciform ligament. The cut surface, in turn, is covered by folding the falciform ligament over the raw surface of the liver.

There are a number of useful adjuncts available for the control of liver hemorrhage while carrying out some of the definitive methods listed. These adjuncts are temporary manual or tourniquet compression of the liver proper, proximal to the line of section, temporary pressure applied to the aorta or hepatoduodenal vessels by use of the fingers, and pressure exerted by use of a bulldog or Blalock clamp. One or more of these methods was used by Schroeder (48) in 1900, McDill (35) in 1912, and Borzeky and Baron (9) in 1914. Others (8, 15, 53) have utilized such expedients in more recent years. The length of time that such clamps can be safely applied has not been determined. Wangensteen (53) has left clamps on the superior mesenteric artery, gastroduodenal artery, portal vein, and hepatic artery for as long as 33 minutes without difficulty. On one occasion, however, following arrest of the blood flow through the patient's liver for periods of 12 minutes and 15 minutes with an interval between clampings of 20 minutes, death occurred from hepatic necrosis within 24 hours after surgery. Berman *et al.* (7) have clamped the hepatoduodenal ligament for approximately 15 minutes during the removal of the left liver lobe and a portion of the right lobe, using a small bulldog clamp passed through the gastroepiploic foramen. During this period the pulse increased from 110 to 160 and the respiration from 40 to 50 per minute. Following removal of the clamps, there was a decrease in the rate of the pulse and respiration. Induced hypotension is another adjunct which has been used clinically and experimentally when carrying out partial hepatectomies (37, 46). A number of techniques have been used to reduce the arterial pressure during surgical operations. These were conceived in an effort to decrease the amount of blood loss, and thus made a dry operative field which facilitated the surgeon's work. In addition, controlled hypotension has been used in an effort to render operable some patients who might otherwise be inoperable because of the danger of hemorrhage. Safar (46) induced hypotension by using hexamethonium bromide and thus made it possible to excise a large echinococcus cyst of the liver which had previously been considered nonresectable. Narat *et al.* (37) have used arfonad (trimetaphan camphorsulfonate) to produce hypotension. They carried out a series of experiments on animals and concluded that definite advantage may accrue from the use of arfonad in partial hepatectomy in which blood losses of such magnitude are anticipated that the patient's life may be jeopardized. Induced hypotension is not an entirely harmless procedure, however, and marked liver damage has been demonstrated in the experimental animal following its use (2).

From the fact that so many methods and combinations of methods for controlling liver hemorrhage have been proposed for resections of the liver as well as for treatment of wounds of this organ, it must be inferred that there is no one method which can be relied upon for all occasions. The ideal method must be readily available, require a minimum of special material, provide

rapid hemostasis, and be followed with no secondary complications. A combination of methods will, in most cases, be found adequate for liver hemostasis both in caring for the injured liver and when resections are required for tumors.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Mandibular Preservation in Radical Cancer Surgery. GERALD BROWN O'CONNOR, MAR W. MCGREGOR, and SHERMAN SAFFIER. *Plastic & Reconstr. Surg.*, 1956, 18: 185.

THE AUTHORS are in agreement with all oncologists that wide cancer removal, preferably en bloc, is a prime requisite of surgery about the mouth and neck. In certain select and isolated cases of carcinoma of the floor of the mouth this can be accomplished, and yet a segment of the mandible can be retained including the symphysis menti area. The authors feel that in certain select instances of carcinoma of the mouth, certain bony segments may be retained without jeopardizing the main premise of the operator—complete and wide removal of the cancerous area.

Interest in this subject was elicited when a 59 year old male patient presented himself with a 12 mm. freely movable lesion in the floor of the mouth. A recognizable border of the tumor was well over 1 cm. posterior to the mandible. To the patient's knowledge, the growth had been present only 3 months, but was enlarging, and the diagnosis had been proved by biopsy. A node 1.2 cm. in diameter was palpable just above the hyoid bone and to the left of the midline.

The operation was performed under intratracheal anesthesia and consisted of a transverse cervical incision with small vertical darts laterally to give greater exposure. The usual midline vertical incision through the lip was not carried out because it was thought to be unnecessary and deforming. A bilateral suprahyoid neck dissection was done and the mandible was adequately exposed. With a Stryker saw, a vertical cut was made from molar to molar, severing the teeth and alveolar process from the symphysis and adjacent mandibular bone. Vertical bone cuts were made behind the molars, isolating the alveolar mandibular segment. The tumor and the floor of the mouth was then isolated by sharp dissection and the entire mass delivered in toto through the floor of the mouth. In this case the mandible was completely exposed; it was divided vertically leaving only the outer cortex and symphysis menti. Two vertical incisions were made in front of the molar teeth to isolate completely the inner bone fragment with the incorporated teeth.

The postoperative care and feeding problems were managed as in any other mouth cancer, but it was felt that the convalescence was faster, more positive, and more comfortable because of the retention of the mandibular segment and the anterior position of the tongue. Because of postoperative complications, the bony segment that remained after a partial sequestrectomy was too small as there was inadequate coverage.

At the present time the patient is quite comfortable. There are two movable mandibular fragments, because of partial lateral bone loss, which will require further surgery. In spite of this, the patient has a good facial appearance and has not developed the usual "Andy Gump" deformity.

The authors underlined and stressed the fact that the procedure has a limited use in selected cases of carcinoma of the floor of the mouth, but if applied here with success it would eliminate many of the postoperative difficulties and be a major step forward in rehabilitating the unfortunate patients with cancer of the mouth and neck. —*F. W. Pirruccello, M.D.*

EYE

Radiotherapy in the Treatment of Orbital Tumors. M. LEDERMAN. *Brit. J. Ophth.*, 1956, 40: 592.

BENIGN ORBITAL TUMORS are quite rare, and in this series consisted of vascular hemangioma and lymphangioma, neurofibroma, and meningioma. Radiotherapy was limited to the treatment of hemangiomas. Hemangiomas in children usually regress spontaneously, and the indications for treatment are hemorrhage, infection, and the location of the lesion.

In the cases of malignant granulomas the outcome is usually fatal, but occasionally radiotherapy is of some value. Patients with primary malignant tumors that were diagnosed histologically as sarcoma of the lymphoid tissue or tumors of the lacrimal gland and found inoperable were treated with roentgenotherapy.

The commonest primary orbital tumor is sarcoma of the lymphoid tissue; these tumors are radiosensitive and respond well to treatment. Rhabdomyosarcomas are rare and highly lethal. They are radiosensitive but not radiocurable, because their recurrence rate is almost 100 per cent. Tumors of the lacrimal gland are also rare and very malignant. The author advises operation and radiotherapy as treatment. In intraocular tumors the usual treatment is removal of the eye, with radiotherapy for extraocular spread.

The complications and sequelae of radiotherapy are: (1) damage to the normal eye, (2) undue contracture and scarring, (3) epilation of the lashes, (4) xerophthalmia and chronic conjunctivitis, (5) corneal ulcer, (6) superficial punctate keratitis, (7) hemorrhage of the vitreous humor, (8) cataract, and (9) osteonecrosis. —*Earl H. Merz, M.D.*

Skin Grafting in the Reconstruction of the Eyelids. A. J. C. Huffstadt. *Arch. chir. Neerl.*, 1956, 8: 212.

The author points out that the function of the eyelids is to protect the eye (especially the cornea), and to maintain a moist surface and a regular flow of tears.

Shortage of skin of the eyelid may be caused by trauma or burns and may follow excision of malignant or benign tumors of the eyelids. Loss of skin with resultant ectropion constantly exposes the eye to the danger of keratitis.

Deformities of the eyelids should be corrected as soon as possible with either a free or a pedicle graft. Free grafts, which may be full thickness or split skin grafts, usually take well. Pedicle grafts offer many possibilities. Neighborhood pedicle grafts vary from the simple Z plasty and simple sliding flaps to those of Imre and Blascowitz. Various types of deformities require various types of plastic surgical reconstructive procedures. —*Joshua Zuckerman, M.D.*

Tumors of the Lacrimal Sac. Ira S. Jones. *Am. J. Ophth.*, 1956, 42: 561.

The reported cases of true neoplasms of the lacrimal sac, including the 6 in this article, total over 100.

Jones distinguishes four stages of evolution: In stage 1 tearing is the only symptom and irrigation usually effects a temporary remission. In stage 2 the condition simulates dacryocystitis and regurgitation of mucopus is produced by pressure over the sac. In stage 3 there is a painless, nonreducible swelling in the region of the lacrimal sac, and in stage 4 the mass is extended.

The positive evidence, that may be indicated by roentgenograms after the injection of lipiodol, is emphasized and illustrated. Complete excision, before the stage of extension, is curative. Microscopic examination makes the definitive diagnosis.

In this series the tumors were carcinomas in situ, squamous-cell carcinomas, lymphosarcomas, Kaposi sarcomas, and lymphomas. Postoperative radiation was used to decrease the chance of recurrence.

—*James E. Lebensohn, M.D.*

A Study of Intraocular Vx2 and Its Treatment. Adolph W. Vogel and Khalida Naib. *Am. J. Ophth.*, 1956, 42: 27.

This is the report of an experimental study on rabbits, with the aim of producing an intraocular neoplasm, and testing the effectiveness of several anticarcinomatous agents against it.

The Vx2 rabbit carcinoma lends itself to transplantation into the rabbit fundus. The technique for preparing the carcinomatous tissue for injection into the eye is described in detail. The intraocular implantations were made halfway between the equator and the optic nerve, and usually 2 millimeters superior to the course of the anterior ciliary artery, transvitreally into a subretinal pocket.

Double foci of neoplastic cells arose in 80 per cent of the host eyes; the host response and the development of the intraocular neoplasm is described and illustrated with photomicrographs. The anticarcinomatous agents tested were Stallard discs, diathermy, chemotherapy in conjunction with diathermy, and chemotherapy alone. The tabulated and illustrated data show that with the Stallard disc this unpigmented neoplasm can grow and spread adjacent to a disc in situ, and a wide collar margin of safety is required in the application of contact radiation over this tumor.

Diathermy failed to overlap the lethal zones of heat diffusion around the tumor borders in 21 of 22 cauterized eyes. The diathermy destruction was done with a current of from 0.1 to 0.2 ma., a pointed 0.5 mm. electrode, and multiple applications of 5 to 10 seconds' duration, until the tumor appeared to be destroyed. Chemotherapy in conjunction with cauterization may be sufficient to eradicate the cells not included in the diathermy barrage. For chemotherapy NH_2 and triethylene melamine were the agents used. The effect on the fundus of these agents, injected through the carotid artery is described in detail. These agents alone in doses tolerated by the eye are not sufficient to control the neoplasm. The treated eyes which had light perception and a nonmalignant condition belonged to the group treated with the Stallard disc.

—*Ray Karchmer Daily, M.D.*

Forty-Seven Consecutive Cases of Intraocular Foreign Body. Philip R. Stevens. *Brit. J. Ophth.*, 1956, 40: 622.

The author reviews 47 cases of intraocular foreign bodies that have been removed by a giant magnet by the anterior route method.

Fifty-one per cent of the injuries were due to striking on metal tools with a metal hammer and 12 per cent were caused by flying chips from co-workers.

The treatment was removal of the foreign body as soon as possible. Once infection is established it is very difficult to control. Of 4 patients who had intraocular infections, all but one lost the eye. The operation of choice was that of approach by the anterior route in all except 3 of the patients. Most of the foreign bodies were small, and they were pulled forward along the tract of entry.

The complications were: (1) infection, (2) hyphema, (3) hemorrhage in the vitreous humor, (4) damage to the lens, (5) damage to the iris, (6) siderosis, (7) retinal detachment, (8) chorioretinal scarring, and (9) cyclitis.

The size of the foreign body is important in the prognosis, and accounts for the amount of damage and the type of complications. The results obtained in the 47 cases varied according to the extent of the injury. If the foreign bodies were not in the vitreous or did not damage the lens, vision was 20/30 or better. Damage to the lens is critical and affects the ultimate prognosis adversely. —*Earl H. Merz, M.D.*

The Effect of Steroids on Tensile Strength of Corneal Wounds. Austin I. Fink and Irving Baras. *Am. J. Ophth.*, 1956, 42: 759.

The authors discuss the effect of steroids on the tensile strength of corneal wounds.

Ophthalmologists have hesitated to use cortisone in inflammatory processes following surgery because early reports in the literature had pointed out that this drug tended to inhibit the healing of the corneal wound. That cortisone would cause a reduction in the tensile strength of corneal wounds was an incidental inference.

In this article the authors do not set out to dispute the well substantiated histologic evidence which demonstrates the inhibition of fibroplastic proliferation in the cornea associated with the use of cortisone. However, their observations on the effect of cortisone on experimentally induced corneal wounds in 71 rabbit eyes lead to the conclusion that there is little or no relationship between the histologic picture in a corneal wound and the actual tensile strength of that wound.

In recent years additional clinical experience with cortisone following cataract extraction and following corneal grafting supports their conclusion.

—Joshua Zuckerman, M.D.

Ocular Wound Healing with Particular Reference to the Cataract Incision. JOHN H. DUNNINGTON. *Arch. Ophth.*, Chic., 1956, 56: 639.

THE AUTHOR discusses the healing of ocular wounds with particular reference to the surgical wound in cataract extraction.

Attention is directed to the slowness with which the posterior part of a cataract incision becomes firmly united; to the tissue responses to absorbable and nonabsorbable sutures; and to the effect of cortisone, corticotropin, thrombin, and heparin upon healing of the ocular wound.

It is pointed out that increased intraocular pressure usually causes fluid to seep through the interstices of a recent wound and that externally applied pressure is more liable to produce a sudden rupture.

The incidence of delayed re-formation or subsequent loss of the anterior chamber in a series of 800 cataract extractions was 13 per cent, a record corresponding closely to Kronfeld's 11 per cent in 749 cases. Postoperative administration of diamox neither cured nor prevented this complication, nor did it influence the incidence of hyphema.

Bleeding into the anterior chamber was noted in 20.6 per cent of 800 cataract extractions.

In 171 of the 297 aphakic globes subjected to microscopic study, faulty healing of the wound was the primary cause of the pathologic process responsible for removal of the eye. The conditions were listed as follows: tissue incarceration 31 per cent, stromal proliferation 32.8 per cent, and epithelial invasion 36.2 per cent.

The use of corneoscleral sutures has greatly reduced imperfections in the healing of the wound, but have not eliminated two conditions frequently produced by slight malposition of the wound, i.e., tissue incarceration and epithelial invasion of the anterior chamber. Epithelial ingrowth occurred in 45.7 per cent of the aphakic globes enucleated because of faulty wound healing. Because this condition may be induced by improper suturing, special attention should be directed to the depth of the bite, the tightness with which the sutures are tied, and the early removal of nonabsorbable suture material. *—Joshua Zuckerman, M.D.*

Lens Changes Following X-Irradiation; Single and Multiple Quadrants. R. D. RICHARDS, E. F. RILEY, and P. J. LEINFELDER. *Am. J. Ophth.*, 1956, 42: 44.

REFERENCE is made to a former investigation which showed that irradiation applied even in high doses to one or two opposite quadrants of a rabbit's lens resulted in partial opacities limited to the irradiated areas. It appeared that the protected portions of the lens prevented the progression to a complete radiation cataract. The aim of this investigation was to explore further the response of the lens to partial irradiation. The technique and the results are described in detail.

Shielding of at least one-half of the rabbit's lens results in partial opacity restricted to the irradiated portion even in doses of 12,000 roentgens. The shielding of one-fourth of the lens does not prevent the formation of a complete radiation cataract. Histologic examination of such partially irradiated lenses one year after irradiation showed that normal lens fiber production has been resumed in the irradiated portion.

Several hypotheses are presented to explain this apparent shielding of the lens by the unexposed portion. The central epithelial zone of the lens may be the source for the replacement of the injured peripheral epithelial cells. The metabolism of the uninjured portion of the lens may be sufficient to sustain the entire lens during the critical period after irradiation, which for the rabbit lens is from 3 to 5 months. The shielded portion of the lens may in some way counteract substances accumulated or released in the injured part.

—Ray Karchmer Daily, M.D.

Retrolental Fibroplasia; Co-Operative Study of Retrolental Fibroplasia and the Use of Oxygen. V. EVERETT KINSEY, JUNE TWOMAY JACOBUS, and F. M. HEMPHILL. *Arch. Ophth.*, Chic., 1956, 56: 481.

ANALYSES OF DATA obtained by a controlled study of the effect of oxygen administration to prematurely born infants on the incidence of retrolental fibroplasia, and of the effect of limiting the supply of oxygen to these infants on infant mortality are presented in detail. The study was organized and co-ordinated by the Kresge Eye Institute and all data obtained by the 18 participating hospitals were sent to the Institute. There were 786 prematurely born infants with birth weights of 1,500 grams or less, who were born in, or brought to, the co-operating hospitals and survived 48 hours; these were divided into two groups. Oxygen in concentrations of more than 50 per cent was administered to one of the groups, consisting of 68 infants, for approximately 28 days, and oxygen restricted to less than a 50 per cent concentration was given to the other group, consisting of 718 infants. The infants assigned to the two groups were as similar as possible in age, size, and birth weight. All controllable conditions in the nurseries were maintained as nearly the same as possible for the two groups, including the type of incubator, temperature, light, humidity, diet, and antibacterial therapy. Blood transfusions were omitted unless indicated clinically. The eyes of the infants were examined ophthalmoscopically until the twenty-fifth week. Of the total number of infants, 586 were followed up for a minimum of 2.5 months.

The mortality rates in the two groups given oxygen were not significantly different. The incidence of re-

trolental fibroplasia in infants receiving oxygen in greater concentrations than 50 per cent was approximately twice that of the other group, and the disease was more severe in the routine oxygen group. Retrolental fibroplasia occurred more often in infants of multiple birth in both oxygen groups but was more frequent, as well as more severe, in those receiving the higher concentrations of oxygen. This may have indicated a difference in the spontaneous regression rate of the disease in infants of multiple birth. The incidence of retrolental fibroplasia was less in the "sicker" infants, indicating that the clinical condition of the infant was not a factor in the development of retrolental fibroplasia. The incidence and severity of retrolental fibroplasia increased rapidly with the length of exposure to oxygen, especially during the first week of exposure, but exposure to oxygen for a period greater than about three weeks did not cause a further increase except in infants of multiple birth. For infants of single birth, the incidence of retrolental fibroplasia was relatively unaffected by differences in the average concentration of oxygen in the range of 35 to 50 per cent. For infants of multiple birth, the incidence increased with concentration in those infants who were exposed to oxygen over a relatively long period of time. Gestational age did not affect the incidence of retrolental fibroplasia. The incidence of retrolental fibroplasia was found to be inversely related to birth weight. Sex, race, type of incubator, transfusions and infusions, medications, dietary adjuncts, frequency of complications of pregnancy in the mother and the average age of the mother were not positively associated with the incidence of retrolental fibroplasia. Rapid withdrawal of infants from an oxygen enriched atmosphere did not increase the incidence of retrolental fibroplasia.

The results of this co-operative study would suggest that the basic policy in prescribing oxygen should be to keep the premature infant in oxygen for as short a period as possible consistent with the clinical indications of anoxia, regardless of the concentration of oxygen employed. —*J. Jack Stokes, M.D.*

The Role of a Distinctive Choroidoretinal Lesion in the Pathogenesis of a Retinal Hole; a Clinical and Pathologic Report. I. C. MICHAELSON. *Brit. J. Ophth.*, 1956, 40: 527.

THE AUTHOR describes several clinical cases of retinal detachment associated with retinal holes. Because of the coexistence of a choroidal sarcoma, he was able to obtain a pathologic specimen in 1 case.

Histologic examination of the area of the hole showed an atrophic pigmented choroidopathy associated with a local retinal phlebosclerosis and fibrillar disturbance of the adjacent vitreous.

The author postulated that chorioretinopathy precedes the development of a retinal hole in the cases of retinal detachment. —*J. Winston Duggan, M.D.*

Ectopia of the Macula. IAN W. PAYNE and R. PITTS CRICK. *Brit. J. Ophth.*, 1956, 40: 492.

ONLY 14 CASES OF ECTOPIA of the macula have been reported. In 2 of the 3 additional cases described in this article the displacement of the macula was probably due to an abortive retrolental fibroplasia.

In the third and most interesting case the condition was acquired from cicatricial contraction of the retina following retinal periphlebitis (Eales' disease), and was apparently aggravated by a diathermy operation, as the patient complained of vertical diplopia 3 months thereafter. Examination then showed the right eye to be 2 mm. below the left, but the distance Maddox rod test indicated a right hyperphoria of 4 prism diopters. With the cover test no deviation was evident. In the right visual field the blind spot was displaced down and outward. With the Amsler charts the right eye observed the horizontal lines above and to the right of the fixation point to be inclined upward and to the right. —*James E. Lebensohn, M.D.*

Central Serous Retinopathy; Clinical and Experimental Studies. MICHAEL I. WOLKOWICZ. *Am. J. Ophth.*, 1956, 42: 531.

THE AUTHOR reviewed the literature and reported 2 additional cases of central serous retinopathy, both with bilateral involvement. Fundal lesions resembling those of central serous retinopathy were produced in rabbit eyes by sensitization to horse serum or by exposure to carbon-arc light. Photosensitivity also produced lesions similar to those of central serous retinopathy. Horse serum sensitivity resulted in lesions which showed, in addition, choroidal involvement (choroidopathy). The author concluded that the exudates in the retina and choroid are the result of an allergic vascular reaction. —*J. Jack Stokes, M.D.*

Spontaneous Regression of Retinoblastoma. J. K. STEWARD, J. L. S. SMITH, and E. L. ARNOLD. *Brit. J. Ophth.*, 1956, 40: 449.

TO THE PREVIOUSLY REPORTED 15 CASES of spontaneous regression of retinoblastoma, these authors add another.

The patient's both eyes presented retinoblastoma. One eye presented a healed lesion almost indistinguishable from a patch of old choroiditis and the other eye was phthisical. Peculiar to healed retinoblastoma is the disappearance of retinal vessels over part of their course and their emergence in the middle of an atrophic area. The difficulty of making the diagnosis may account for the small number of reported cases.

Hope of spontaneous regression must not supplant standard management (enucleation and irradiation), as one cannot predict in which particular case this may occur; indeed, the tumor may regress in one eye and grow in the other. In the case reported the sighted eye had nystagmus and a visual acuity of 20/200.
—*James E. Lebensohn, M.D.*

NOSE AND SINUSES

Scleroma; a Review with Report of a Case. L. W. FALKINBURG and F. C. MACCARDELL. *Arch. Otolar.*, Chic., 1956, 64: 190.

THE AUTHORS report a case of scleroma (rhinoscleroma) in a Russian-born immigrant, and review the literature on the subject. The condition is a chronic granulomatous lesion of the respiratory tract, but lesions have also been reported in the lips, cheeks, gums, lacrymal ducts, and palate. The disease is limited to the mucosa or skin, but grotesque deformi-

ties may occur and lead to symptoms varying with the lesion site. The microscopic appearance is usually characteristic and contains Russell bodies (red cells with pyknotic nuclei) as well as the more specific foamy, vacuolated Mikulicz cells. The disease formerly had endemic foci and is now becoming ubiquitous, but it remains restricted to the lower economic groups. Its etiology remains uncertain.

Surgical removal followed by irradiation has been the treatment of choice, but streptomycin and dihydrostreptomycin have recently given good results. The prognosis is fair as to longevity, but severe deformities are common. Approximately 126 cases have been reported in the United States and Canada; of these patients, 98 were foreign and 28 were native born. —*John R. Lindsay, M.D.*

Complications Following Rhinoplasty. SAMUEL COHEN. *Plastic & Reconstr. Surg.*, 1956, 18: 213.

THE BEST TREATMENT for complications following rhinoplasty is their prevention, but the unpredictable may occur after the most skillfully conducted procedures. The correction of complications can be accomplished with precision when the causal mechanisms are fully understood, and the author, while discussing primary technique designed to offset their development, explains the reasons for the occurrence of some of the possible complications and the logical steps required for their correction.

Irregular nostrils may be present before surgery, in which case bilaterally equal correction will leave the irregularity unchanged. Alar retractions or dents are usually due to excessive removal of either upper or lower laterals. In attempting to correct a flat ala the author recommends a modification of the Kilner method, a maneuver which also narrows and rounds the nostril floor.

Other nostril deformities discussed include defects of the alar margins and nostril flaring. Dropped tip is the most common complication after rhinoplasty and occurs most frequently in heavy, thick-skinned noses. Among its causes are inaccurate approximation of the septocolumellar margins, suture of the columella and lower septal borders en masse, and failure of removal of sections of the tip cartilages. Bulges and depressions may result from leaving an excess in the anterior septal cartilage border, or from retention of an excess of the upper segment of the angle and medial plates of the lower laterals. Columella abnormalities are often due to unequal removal of the lower laterals, while lower septal border thickening often follows total suture of columella and septal cartilage. Other complications which are discussed include the broad nasal tip and intranasal adhesions.

—*John R. Lindsay, M.D.*

MOUTH

Stress as an Etiologic Factor in the Development of Cleft Palate. LYON P. STREAN and LYNDON A. PEER. *Plastic & Reconstr. Surg.*, 1956, 18: 1.

VARIOUS CONGENITAL DEFECTS have been produced in experimental animals as a result of changes in intrauterine environment. The induced changes include vitamin A deficiency, riboflavin deficiency, x-radiation, nitrogen mustards, insulin injection, and thyroxine administration.

Similarly, the administration of cortisone to pregnant mice at a time when the maxillae of the fetuses were expected to fuse caused a high incidence of cleft palate and other abnormalities. Stress in the human may lead to the over-production of hydrocortisone, and the authors' investigation sought to establish the relationship, if any, between stress in human pregnancy and the occurrence of cleft palate in the offspring. The maternal case histories of 232 children with cleft palates were examined by questionnaire, and a control group was established by similarly questioning the same mothers concerning their other pregnancies in which there had been no such defects in the infants. The case histories revealed a high incidence of physiological, emotional, or traumatic stress at the times when the maxillae in the embryos were expected to fuse.

The authors conclude that the problem is sufficiently important to warrant further investigation.

—*John R. Lindsay, M.D.*

Cancer of the Tongue and Its Metastases; Clinico-statistical Report on 772 Cases (Il cancro della lingua e le sue metastasi; Rendiconto clinico-statistico di 772 casi). PIETRO BUCALOSSI and SERGIO DI PIETRO. *Tumori*, Milano, 1956, 42: 244.

THESE 772 CASES OF LINGUAL CANCERS from the records of the cancer center at Milan, Italy, comprise 3.5 per cent of all the malignant tumors observed at this clinic in the period from 1928 to 1951, and 25 per cent of all the malignant tumors of the oral cavity. Carcinoma comprises 98.7 per cent of all the malignant forms of lingual lesions observed during this period. Eighty-four per cent of the patients were males; the average age of the patients was 62 years. The carcinomas here reported proved histologically to be of the spinocellular type.

Chief among the etiologic factors uncovered in this material were tobacco, traumatism (dental plates; dental protheses), leucoplakia, papillomatosis, and lues.

In the period from 1928 to 1935 the treatment was predominantly that of interstitial radium irradiation by means of radium needles or capsules; since that time there has been a renewed swing toward surgical therapy, perhaps supplemented by irradiation. En bloc excision of the tumor together with its cervical glandular metastases and with or without resection of the mandible, has come to be particularly well regarded. The results of this trend during the past 14 years seem to be reflected in the higher percentage of 5 year survivals. In the period from 1928 to 1935, the 5 year survivals made up 21.4 per cent; in the period from 1936 to 1950 they rose to 38.6 per cent. The 5 year survivals were most numerous in the cases of cancer of the dorsum of the tongue, in the female patients, and in the dorsolingual group, despite the fact that in these cases the metastases to the cervical glands are apt to occur bilaterally. There were 5 cases in which bilateral removal en bloc seemed to be indicated. One of the patients died, after a year, of lingual recurrence; another died of postoperative bronchopulmonitis; a third is alive and well after 7 years;

the fourth died after 2 years of lingual recurrence; and the fifth is alive and well after 2 years. Removal en bloc of the regional lymph node system has been practiced in 121 patients with a 5 year survival rate of 42 per cent, as compared with a survival rate of 35.3 per cent in a group of 181 patients not so treated. This occurred in spite of the fact that the patients not so treated were cared for at a much earlier period.

In conclusion the authors emphasize the importance of a systematic adoption of prophylactic excision of the lymph node area in the neck. They favor recourse to en bloc removal of the tumor and its metastases in the more advanced cases. —*John W. Brennan, M.D.*

The Natural History and Effects of Treatment of Cancer of the Tongue. MERLIN K. DUVAL, JR., and MARTIN J. HEALY. *Cancer*, Philadelphia, 1956, 9: 842.

THE CLINICAL FINDINGS and behavior in 168 cases of cancer of the tongue are presented. Follow-up was complete in every case. More than 16 per cent of the patients had a history of treated syphilis or positive serology. Only 13 patients had had symptoms for more than one year; the median duration of symptoms at the time of admission was two months. The usual tumor size was 3.0 to 4.0 centimeters across, with the extremes being 1.0 centimeters and 9.0 centimeters, while in one case the primary tongue lesion became evident only after the recognition of cervical metastases. Fifty-eight per cent of the tumors involved both the floor of the mouth and the tongue. All of the tumors were epidermoid or squamous-cell carcinomas, and 95 per cent were of Grades II and III. It was observed that the tumors of the middle third of the tongue showed the least tendency to metastasize. Palliative treatment did not prolong survival time, and a significant number of patients failed to respond to therapeutic radiation. More than 10 per cent of the patients subsequently developed a second primary squamous-cell carcinoma. The total 5 year cure rate was 13.4 per cent; the presence of cervical metastases had a serious effect upon prognosis. Since 61.2 per cent of the patients had cervical metastases on admission, it is believed that the cases constituted a difficult-to-treat group. —*John R. Lindsay, M.D.*

PHARYNX

Surgical Approaches to the Pyriform Sinus. NORMAN JESBERG. *Arch. Otolar.*, Chic., 1956, 64: 258.

THE ANATOMY AND PHYSIOLOGY of the pyriform sinuses are reviewed in brief and a general review of surgical approaches to the sinuses is presented. Indirect and direct laryngoscopic and hypopharyngoscopic techniques are discussed and illustrated by case reports. External transthyroid lateral pharyngotomy is discussed, but the limitations of this approach, recognized by Trotter who pioneered it, are emphasized. Lateral pharyngotomy may seriously disturb the sphincteric actions of the larynx, and its use in malignant lesions should be limited to the exposure and removal of small growths on the lateral surface of the epiglottis or aryepiglottic folds where primary pharyngeal closure may be effected. Its value in the exposure and removal of benign pyriform sinus lesions is illustrated by a case report.

The author mentions but advises against partial pharyngolaryngectomy. Pharyngolaryngectomy is discussed in general terms and illustrated by a case report in which ipsilateral radical neck dissection was also carried out. —*John R. Lindsay, M.D.*

NECK

The Management of Thyrotoxicosis. VICTOR RIDDELL. *Brit. J. Surg.*, 1956, 44: 25.

IN THIS COMPREHENSIVE REVIEW the three major modalities of therapy, namely, the antithyroid drugs, radioiodine, and surgery, are appropriately aligned with the various types, stages, and degrees of thyrotoxicosis, as well as the age and the preferences of the patient.

Medical therapy is indicated in all patients with mild thyrotoxicosis (so classified if the sleeping pulse-rate is below 90). This should take the form, first, of bed rest, change of environment, and sedation; later, if necessary, antithyroid drugs are added. Iodine should never be employed in the medical therapy of any form of thyrotoxicosis except as a preoperative preparation, because it masks the symptoms without curing the diease. It is in this regard comparable to the use of morphine for an acute condition of the abdomen.

Medical therapy is primarily employed in the poor operative risk, in young children, in the elderly, and during periods of exceptional physiological stress, such as puberty, pregnancy, and the menopause. Severe exophthalmos requires the use of thyroid hormone to allay the production of pituitary thyrotropin which seems responsible for the increase in proptosis otherwise noted after either thyroidectomy or antithyroid agents. Cortisone and stilbestrol have also been able, occasionally, to depress the thyrotropic output.

Recurrent postoperative thyrotoxicosis is best managed medically if there is no palpable thyroid tissue or, even if palpable, if there is contralateral vocal cord paralysis. If there is ipsilateral vocal cord paralysis, then re-exploration does not carry the risk of damaging the only remaining recurrent nerve, and surgery is sanctioned. Pyramidal lobe recurrence is best treated by excision.

On the other hand, surgical therapy is indicated if there are pressure symptoms present or if they are likely to be precipitated by antithyroid drugs which may cause further gland enlargement. A coarsely nodular gland or, more urgently, a unilateral adenoma associated with toxicity is best managed surgically. If the patient is elderly and if the nodularity is merely a smooth asymmetry in size of the two lobes, good results can be obtained in selected cases from medical treatment only. The possibility of malignancy or a cosmetically intolerable large gland is also best treated surgically. The patient with thyrotoxic fibrillation is brought to a safe operative level with antithyroid drugs and if there is no cardiac failure, then the author favors surgical resection. If cardiac failure is present, radioiodine is preferred.

Approximately 10 per cent of the patients will experience an untoward reaction to the antithyroid drugs. Of these, three-quarters will manifest this re-

action by the eighth week of therapy. Bone marrow depression, as indicated by a drop from the pretherapy level of 1,000 polymorphonuclear cells in the peripheral blood count, is regarded as an indication for surgery or radioiodine therapy. If there is no marrow depression associated with the reaction, which may include a rash, malaise, arthralgia, sore throat, headache, or fever, then a second antithyroid agent is tried before this form of treatment is abandoned. On the other hand, if there is no evidence of clinical response to the program after 2 months, the patient is regarded as resistant to antithyroid drugs and thyroidectomy, preceded by iodine, is recommended.

If the patient responds to antithyroid therapy, the program is continued for a full 12 months before discontinuance. Approximately half of the patients will subsequently have a relapse and usually it occurs within 4 months. On relapse, the patient is re-evaluated for retreatment with antithyroid drugs or surgery.

Although there is no evidence of a carcinogenic effect of radioiodine in man, there is evidence of such activity in the rat. Accordingly, its use is limited to patients more than 45 years of age, and is absolutely contraindicated in pregnancy because the fetal thyroid may take up the isotope.

For a series of 250 patients subjected to five-sixths resection of both lateral lobes, removal of the isthmus, removal of the pyramidal lobe, and ligation of all four arteries, the author reported 2 deaths (0.8 per cent) and 3 instances (1.4 per cent) of transient carpopedal spasm which responded to a single injection of intravenous calcium in all 3 instances. Eight of the patients became myxedematous, and 3 of these are likely to require thyroid therapy for the rest of their lives. —*Everett Shocket, M.D.*

A Study of Hürthle Cell Tumors of the Thyroid Gland; a Report of 9 New Cases. DONALD C. COLLINS. *Arch. Surg.*, 1956, 73: 228.

A REVIEW of the literature concerning Hürthle cell tumors indicates that the type of cell involved was first described by Baber 17 years before Hürthle's description in 1894. There are eleven different principal theories explaining the origin of the Hürthle cell, with some writers disputing the existence of a specific cell-type in the thyroid gland. Even if such a cell-type exists, there is a lack of evidence to prove that these cells are the source of what is commonly called a Hürthle cell tumor. A simple descriptive name, such as "eosinophilic large-celled tumor of the thyroid" is advocated by many.

Different histologic patterns are encountered in this pathologic entity. The "Hürthle cell reaction" is a specific reaction occurring in the thyroid gland which is characterized by the appearance of large cuboidal, irregularly polyhedral, or cylindrical cells with eccentrically placed nuclei and finely granular cytoplasm that may have a foamy or vacuolated appearance. The nucleolus is commonly prominent and hyperchromatic. An alveolar pattern is the most common, but other patterns may occur. The reaction may occur in the normal thyroid gland, in thyroiditis, in nodular or colloid goiter, toxic or nontoxic, or in carcinoma.

A thyroid carcinoma with an intense Hürthle cell reaction is termed a Hürthle cell carcinoma. This reaction appears to be associated with a diminished growth potential, so these carcinomas have a better prognosis than other thyroid carcinomas. Vein invasion is not conclusive evidence of an imminent fatal outcome. Local metastases may occur, but distant metastases are rare. Probably the actual degree of malignancy is determined by the potentials of the original tumor present in the gland before the Hürthle cell reaction occurred, though it appears such a reaction is more common in tumors of lesser malignancy.

There are 384 cases of Hürthle cell tumor reported in the previous medical literature, and 9 new cases are reported in this article. Approximately 60 per cent of all the tumors in the reported cases have been malignant. Females are affected more commonly than males and the patients are usually over the age of 40. The history is usually that of an enlarged gland or nodule in the gland for several years.

The treatment is surgical excision, preferably of the isthmus and the entire lobe on the involved side. Radical neck dissection, usually not indicated, was performed in 11.4 per cent of the 119 cases reviewed. Complete lobectomy is advocated for any solitary nodule of the thyroid as insurance of fewer recurrences of any thyroid carcinoma. Higher grades of malignancy of the Hürthle cell tumors are more common in the reports from other countries.

—*Stanley W. Tuell, M.D.*

A Clinicopathologic Study of Thyroid Carcinoma. ROBERT ALHADEFF, FOSTER SCOTT, and SELWYN TAYLOR. *Brit. J. Surg.*, 1956, 43: 617.

THE AUTHORS present an analysis of the findings in 67 cases of thyroid cancer observed at the Hammersmith Hospital, in London. Upon histologic study, follicular carcinomas were found to be the most common (45); next in frequency were undifferentiated carcinomas (18), papillary carcinomas (14), and miscellaneous neoplasms (4). It was noted that the three main histologic types were confined to a distinctive age group. Thirty per cent of the patients had had a preexisting thyroid enlargement for more than 10 years. Regardless of the histologic type, half the carcinomas had metastasized to the regional lymph nodes by the time the patients were first seen, and half of the patients with follicular and undifferentiated carcinomas presented distant metastases.

Radioiodine uptake was most common in follicular carcinomas, but was encountered occasionally, and unpredictably, in other types. Evidences of hyperthyroidism were found in 4 patients. In one patient a hyperfunctioning primary thyroid cancer was found, and in 2 patients a hyperthyroidism due to the sheer bulk of functioning metastases. The clinical course in this series showed good correlation with the histologic classification and grading of the tumors.

Almost half the patients with follicular cancer of the thyroid died within a period of 6 years from the time they were first seen. Of the 14 patients with papillary carcinoma, 2 died. All of the patients with giant cell cancers were dead within an average period of 3 months, and three-quarters of those with small cell carcinomas died within an average of 6 months.

The details of treatment are briefly described; it is noted that a total thyroidectomy was performed in 7

patients, and block dissection of the neck was utilized in only 4 patients. —*Harvey W. Baker, M.D.*

Large Solitary Cysts of the Parathyroid Gland. W. Milo Keynes and Brian McN. Truscott. *Brit. J. Surg.*, 1956, 44: 23.

The development of a lump in the region of the left lobe of the thyroid in a 40 year old spinster prompted exploration. The preoperative diagnosis was nodular goiter. A thin-walled cyst, 5 by 4 centimeters, was found to be pushing the left lobe of the thyroid upward. It was readily shelled out and its thin, slightly milky fluid content was subsequently released. Microscopically the cyst was lined by flattened epithelium with islands of parathyroid tissue in the wall.

Thus, the authors report the fourteenth recorded instance of a large parathyroid cyst, although Cope is quoted as having communicated with the authors in regard to one unreported case. Eleven of the cysts have been in the region of an inferior parathyroid. They have varied in size from 1 cm. in diameter to 7 by 3 cm. All have presented as a lump in the neck and have been almost invariably diagnosed as a nodular goiter.

—*Everett Shocket, M.D.*

Tracheostomy; Indications and Technique in Surgical Practice. Harvey W. Baker and Robert A. Wise. *Am. J. Surg.*, 1956, 92: 416.

Tracheostomy should no longer be considered an operation to be employed solely for acute obstruction of the upper respiratory passages. The procedure is also indicated as a prophylactic measure for laryngeal obstruction and as a treatment for secretory obstruction of the lower respiratory tract. It should be employed for the latter condition whenever the patient is unable to expel his tracheobronchial secretions and when nasotracheal suction or bronchoscopy gives only temporary relief.

At the Portland Veterans' Hospital, Oregon tracheostomies were employed in the care of 65 patients during a two year period. In 44 patients the procedure was used to prevent or treat obstruction of the upper respiratory tract. The prophylactic tracheostomies were used largely at the time of radical surgery for cancer of the head and neck. In 21 patients tracheostomy was used to treat secretory obstruction of the lower respiratory tract. This group of patients included cases of head injury and patients undergoing neurosurgical, thoracic, and abdominal operations.

The etiology of lower respiratory tract obstruction and its physiological sequelae are discussed. Tracheostomy is of value for this condition not only by virtue of facilitating suction of the tracheobronchial tree, but by permitting easier respirations, reducing aspiration of saliva, and reducing the "dead space" between the oronasal passages and the pulmonary alveoli.

A Case of Tumor of the Carotid Glomus (Su un caso di tumore del glomo carotideo). S. Stipa. *Ann. ital. chir.*, 1956, 33: 66.

The author describes another case of carotid body tumor and reviews the literature. The patient was a 22 year old woman who, when first seen, had an egg-sized tumor on the left side of the neck, which had been present for about a year. It was thought to be either a branchial cyst or a carotid body tumor. At operation under general anesthesia it was found necessary to resect the carotid arteries to remove the tumor. The patient made an uneventful recovery and has remained well for more than a year.

The author discusses the desirability of carotid angiography as a preoperative study although it was not done in his case. He also believes that a blood vessel anastomosis or graft would have been a desirable procedure although neither was done.

—*Nicholas Wetzel, M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Disturbances of Cerebral Circulation of the Blood Following Skull Injuries (Die cerebralen Durchblutungsschaeden nach Schaedeltraumen). TH. TIWISINA. *Chirurg*, 1956, 27: 390.

IN THIS GENERAL discussion the author concludes that the disturbances of cerebral circulation of the blood following trauma to the skull are of variegated character and difficult to trace to their true causal factors. Nevertheless, their meaning should not be underestimated because of an insignificant clinical picture, thereby perhaps missing the opportunity of applying a true causal therapy. The author believes that in any instance in which the diagnosis is in doubt recourse should be had to angiography of the cerebral blood vessels when there has occurred a closed injury to the skull.

The author presents a number of interesting cases with reference to their clinical and roentgen findings and to the effects of the treatment administered. He cites the instance of the young man with a basal skull fracture which resulted in a pulsating exophthalmos from an arteriovenous aneurysm of the sinus cavernosus. This patient was cured completely by a regime of digital pressure over the internal carotid artery. Also cited is the instance of thrombotic closure of the arteria cerebralis media with intracranial hemorrhage. A hemiplegia developed, but with opening of the skull operatively and with evacuation of the hemorrhagic and breaking down contusion focus over the thrombotic middle cerebral artery at its point of occlusion the result was complete recovery. The brain tissue formerly supplied by the thrombosed middle cerebral artery was now taken care of by collateral branches from the opposite side of the brain.

The above conditions are, of course, exemplars of symptoms that develop on the basis of actual mechanical interference with the blood supply by lesions of a gross pathologic nature, such as could be demonstrated angiographically. Of equal interest are those instances in which mechanical obstruction cannot be demonstrated by angiographic methods.

In this last connection may be mentioned the case of the 54 year old engineer who complained of severe headaches following an auto-accident, and who developed a right-sided hemiplegia and sensory aphasia a couple of days later. The arteriogram disclosed an absence of contrast filling of the finer branches of the middle cerebral artery (Aa. termorales and Aa. operculares parietales) and inadequate filling of the middle cerebral artery itself. There was some evidence of arteriosclerotic changes in the internal carotid artery of this same side. Blocking of the sympathetics was carried out, and 2 months later the angiogram disclosed almost complete re-expansion of the middle cerebral artery and its branches; the neurologic symptoms had largely disappeared.

In these instances of posttraumatic functional disturbances of the intracranial blood supply, the author has frequently found an accompanying hypotension of the spinal fluid. This finding must be given serious consideration, since the frequently administered dehydration and sedative treatment, which in these patients is usually directed against a postulated cerebral edema and the psychic disturbances so frequently encountered, are apt to have unfavorable effects. The author has been treating the patients that show hypotension of the cerebrospinal fluid (aliquorrhoea) by means of oral, subcutaneous, or intravenous fluids (about 2,000 cubic centimeters per day), repeated novocain blockade of the sympathicus (5 to 10 cubic centimeters of a 0.5 per cent solution of novocain without the addition of epinephrine) and hydergin (Sandoz) in increasing amounts.

The author believes that the arteriorgram and the physiologic pressure of the cerebrospinal fluid form indispensable elements for the substantiation of the diagnosis of skull injuries and for the control of the efficacy of the therapy instituted.

—John W. Brennan, M.D.

The Clinical Aspects of Subdural Hematoma; with Special Regard for the Question of Trauma and Subdural Hematoma (Die Klinik der subduralen Haematome; unter besonderer Beruecksichtigung der Frage Trauma und subdurales Haematom). H. LENNARTZ and H. R. MÜLLER. *Chirurg*, 1956, 27: 385.

THE AUTHORS present a report of 52 cases of subdural hematoma. They are divided into 2 groups: acute-subacute subdural hematoma (7 cases) and chronic subdural hematoma (45 cases). This latter group is further subdivided into 28 instances (group A) in which there was no histologic evidence of the concomitant presence of pachymeningitic changes and 17 instances (group B) with such histologic evidence.

Of prime importance in all these cases is the question of whether trauma is always the cause of this condition, or whether the causative factor, in the older patients who suffer this intracranial pathology, may not be at times a predisposition to the bleeding (intradural hematoma of pachymeningitis hemorrhagica). How important this question is in a medicolegal sense is illustrated by a case report of a 53 year old working man who had fallen unconscious and vomited in his own home. His return to consciousness was accompanied by severe headaches. Somewhat less than 2 months later, the patient bumped his head while greasing a machine. Four days later he visited a physician with a complaint of headaches. A roentgen examination disclosed a calcified pineal gland which was markedly displaced to the right. Three weeks later the patient was operated upon for symptoms of rapidly developing paralysis, speech disturbances, and psychic changes. Further evidence was furnished by a carotid arteriography, with the diagnosis of a subdural hematoma on the left side.

Following the operation the psychic disturbances and the speech defect continued, and the patient applied for complete disability compensation. However,

on the basis of the operative findings (thickened and friable hematoma capsule) and the history, it was assumed that the hematoma was the result of intradural bleeding in pachymeningitis hemorrhagica, and that the original causative agent was the fall in the home, and the trauma to the head while greasing the machine. In consideration of the insurance doctor's failure to recognize the significance of the displaced pineal gland, it was decided that the insurance should be assessed at 75 per cent of total disability.

In general the authors believe that in the acute and subacute forms of subdural hematoma trauma should be considered of decisive significance. In the chronic forms the possible significance of trauma as an etiologic factor should not be denied; however, in these latter instances each case should be carefully considered and adjudged in accordance with the symptomatology, history, and roentgenologic and histopathologic findings. —*John W. Brennan, M.D.*

The Diagnosis of Chronic Subdural Hematoma (Text in Bulgarian). PH. PHILOPOV. *Chirurgia*, Sofia, 1956, 9: 112.

THIRTY-EIGHT INSTANCES of chronic subdural hematoma, treated at the neurosurgical clinic at Sofia, Bulgaria, are discussed by the author. An early and precise diagnosis is of great importance for the institution of timely and correct surgery, and in order to avert an otherwise inevitable lethal outcome.

A history of trauma is not always forthcoming and even when it is it is not pathognomonic; however, the condition develops more frequently when trauma has spent its force in an anteroposterior direction or vice versa (falling and striking of the back of the head; blow on the forehead), rather than from side-to-side. In the former eventuality the brain has more room for movement, which endangers the bridging venous channels from the arachnoid to the cranial vault.

The latent interval, the time between the alleged injury and the initiation of the syndrome was from 3 to 5 months in 5 patients, it was 7 months in 1 patient; and from 1 to 3 months in all the others.

Headache was the universal symptom; it was constant and stubborn, varying in intensity from time to time; it was but slightly influenced by medical treatment. At times it was associated with dizziness which developed in 50 to 70 per cent of the cases.

Choked disc was frequent. As a rule this symptom presented a progressive course and did not vary greatly in intensity. In this series of patients there was no evident relationship between the eye ground manifestations and the severity of the general clinical picture; a slight indication of choked disc would be associated with a severe precomatose condition and, conversely, a choked disc of 7 to 8 diopters would be found with a relatively well maintained general status.

Psychic disturbances, comprising a little more than half of the material here discussed, were largely of the character of manifestations of increased intracranial tension (somnolence, apathy, loss of memory, delayed mental responses).

Focal symptoms were rather scant in number and in intensity. When present, they usually consisted of disturbances caused by motor deficiency (hemiparesis). This deficiency seems to be caused, in most instances, by displacement of the cerebrum and brain stem so as to impinge on the tentorium. Thus the side of the motor deficit (homolateral) may cause confusion, the lesion (hematoma) usually being located on the wrong side. Such erroneous diagnoses have actually occurred (Grant). This author states that in two-thirds of the patients with hemiparesis the hematoma is homolateral, and in one-third it is contralateral. Evident disturbances on the sensory side were not observed in the authors' material, and rarely did the disturbances involve the cerebrospinal nerves. The abducens nerve was most frequently involved, and confusion in respect to mastoid infection often occurred. Extremely rare manifestations consisted of involvement of the sublingual, facial, and auditory nerves. Homolateral mydriasis, while not pathognomonic, is of great significance when associated with other localizing symptoms.

Cerebellar symptoms (staggering, dysmetria, adiadochokinesia, nystagmus) occur but are not pronounced and usually require careful search for their origin.

One of the most characteristic manifestations of a paraclinical nature is the lowered pressure of the cerebrospinal fluid upon lumbar or suboccipital spinal puncture. This sign is of special significance as it is apt to be associated with manifestations of increased intracranial tension.

Of the roentgen signs, two are of pathognomonic significance. One sign is the uniform displacement of the lateral ventricles toward the unaffected side, or toward the least affected side when the lesion is bilateral. As a rule, there is no evidence of deformation of the ventricle, such as would be expected in other lesions causing ventricular displacement.

The other pathognomonic, or practically pathognomonic, sign is obtained with cerebral angiography. Here the sac of the hematoma is portrayed as a perfectly characteristic area extending between the internal table of the cranium and the surface of the cerebrum which is free from blood vessels, as delineated by the shadow of the cerebral vessels. This image is best observed during the arterial phase of the examination and best procured in sagittal exposure. The only other condition producing a comparable manifestation on angiography is cerebral hydroma.

The author considers that the diagnosis of chronic subdural hematoma should be an easy one, if its possible existence is kept in mind and its signs and symptoms are sought. —*John W. Brennan, M.D.*

Giant Adenomas of the Hypophysis (Les adénomes géants de l'hypophyse). M. DAVID, J. P. CONSTANS, and J. LEPOIRE. *Sem hôp. Paris, Ann. Chir.*, 1956, 32: 761.

WHILE MASSIVE adenomas of the pituitary gland are considered relatively rare, they may occur in as high an incidence as 33 per cent (Cushing). By definition the authors classify "giant adenomas" as those in which the extrasellar portion is of greater volume than the intrasellar portion. Since at operation it is virtually impossible to remove all the extrasellar extensions of such a mass, the weight of the tumor as removed can-

not be a criterion of its total size. Of the authors' 12 patients, 4 died postoperatively, and a mortality of approximately that degree has been the experience of other neurosurgeons as well.

Giant adenomas of the hypophysis occur as either basophilic or acidophilic in the same proportion as do those tumors confined within the sella. The classic intrasellar adenoma presents clinical signs which are of a fairly constant and well recognized nature, but, by contrast, the giant adenomas produce a rich and varied symptomatology because of the erratic manner in which they may spread and disturb the complex neurologic anatomy in the parasellar region. The Circle of Willis and its branches, the hypothalamus and third ventricle, the anterior 6 cranial nerves, and the frontal lobes may all or each in turn be profoundly altered in function, so that the clinical picture, except for the endocrine changes, may simulate rather a tumor of extrasellar origin. The authors have found arteriography and fractional pneumoencephalography useful in diagnosis, in addition to the usual x-ray study of the skull.

The subfrontal-temporal approach through a large craniotomy is the only safe approach to such a menacing lesion. Exposure must be wide. Depending upon the extent of the tumor and its attachments, resection of part of the frontal or temporal lobe, section of one optic nerve, sagittal division of the chiasm, clipping of one anterior cerebral artery, or a transventricular approach to the tumor may be necessary. It is often impossible to remove the tumor without first doing intracapsular curettage; indeed, it is more often than not impossible to remove the entire tumor by any means. Preoperative and postoperative support by endocrine therapy is necessary. The authors used postoperative deep x-ray treatments on 5 of their patients.

This is a well organized, informative article on an important subject. There are several excellent photographs of tumors and diagnostic roentgenograms, some of which are in color. —*John Martin, M.D.*

Cystic Astrocytoma of the Cerebellum; an Anatomico-clinical Study of 44 Cases; Operative Results (Les astrocytomes kystiques du cervelet; étude Anatomoclinique de 44 cas; résultats opératoires). P. Wertheimer and M. Corradi. *Sem. hôp. Paris*, 1956, 32: 2179.

In a series of 44 patients with cystic astrocytoma of the cerebellum, 23 were male and 21 were female. The average age of the patients was 22 years, which is somewhat older than the age of most of these patients reported in American series. The authors do not believe that trauma or antecedent contagious disease, such as whooping cough or measles, has anything to do with the etiology of the tumor.

The description of the pathologic anatomy of the tumor is excellent. There is a typically well demarcated mass with a shell which separates quite easily from the surrounding normal tissue, a yellow cystic fluid of high protein content, and a mural nodule. In discussing the histologic appearance of the tumor, the authors report that there was only one protoplasmic astrocytoma, all the others being of the fibrillary type.

The well recognized clinical signs of cerebellar dysfunction typical of a destructive, expanding lesion of the posterior fossa are reviewed. The authors found that their patients fell into four main groups: (1) those without increased intracranial tension but with cerebellar signs, (2) those with a moderate increase of intracranial tension and with cerebellar signs, (3) those with a severe increase of intracranial tension, sufficient to mask the cerebellar signs, and (4) those with a severe increase of intracranial tension, a cachectic state, bulbar embarrassment, and various changes in the cranial nerves.

If the cerebellar symptomatology is laterally located in a general sense, then the lesion is probably in the indicated cerebellar hemisphere, but the presence of unilateral signs does not eliminate the possibility of a lesion in the midline (vermis or fourth ventricle). The differential diagnosis is concerned mainly with neurospongiosum and arachnoiditis of the posterior fossa. Papillomas of the chorid plexus and ependymoma are, in their experience, more rare in the posterior fossa. The preoperative differential diagnosis between astrocytoma and hemangioma is very difficult.

The authors find that 63.6 per cent of their patients have been greatly benefited by surgery, the only form of treatment for these lesions. In fact, 17 of their patients have survived more than 5 years. The authors are particularly concerned with the damaging effects of high intracranial tension on later vision, and 2 of their patients were postoperatively blind from bilateral optic atrophy. These tumors must be treated promptly when such increased intracranial tension is present, but not until after a careful appraisal of the neurologic signs, electroencephalography, ventriculography, and skull roentgenography.

—*John Martin, M.D.*

The Histomorphologic and Histochemical Profile of Rhinopharyngeal Chordoma (Il profilo istomorfologico e istochimico del cordoma rinofaringeo). S. Iurato and G. B. Leonardelli. *Tumori*, Milano, 1956, 42: 559.

Three cases of spheno-occipital chordoma with rhinopharyngeal involvement are reported. This study was made exclusively on biopsy material; in 1 instance roentgen therapy was tried, but the patient did not react well and died 4 months later of neoplastic cachexia and respiratory complications. Another patient was treated with x-rays and was clinically cured. She was well at the last report 4 months later. The third patient is at present receiving x-ray therapy.

The tissues procured by biopsy were treated by various methods of fixation (Dubosq-Brasil, Sylvén, Helly, "freeze-drying") and of staining (Mallory, hematocylin-eosin, Van Gieson, Hotchkiss-McManus, Feulgen).

In a previous communication one of the authors (Iurato) reported that, just as in the notochordal rests of the nucleus pulposus, the neoplastic tissues are of two kinds, the cellular component with large, rather clear, nuclei and typically vacuolated protoplasm, and a heavy investing substance.

The cellular component consists of islands and bands of large, clear nuclear cells and of more or less separate islands of smaller cells with densely staining chromatin which give an intense Feulgen reaction with

ribonucleinic acid. The authors consider this reaction indicates a cytogenic (neoplastic) activity. They regard the small islands of dense, smaller cells as niduses for the prolific cell formation.

The Hotchkiss-McManus reaction for polysaccharides was very intense in the protoplasm of both the large and small cells, being abundant even in the large vacuolated cells where almost the entire protoplasm consisted of a huge, optically empty vacuole (physalides of Virchow). Enzymatic tests indicate the presence of glycogen, and the authors subscribe to the claim of Caspersso and Santesson (*Acta Radiol.*, Stockh., 1942, Supp. 46) that this finding indicates an intense metabolic activity in the physiologic synthesis of protoplasm. The fact that the Hotchkiss-McManus reaction was negative in the protoplasmic component of the cells of the notochordal rests in the intervertebral disc is explained on the basis of the relative quiescent state of this tissue.

The authors believe that similarities between the histochemical findings in the notochordal rests and those in the chordoma, are sufficient to indicate that the notochord is the source of the chordoma.

—*John W. Brennan, M.D.*

SPINAL CORD AND ITS COVERINGS

The Surgical Treatment of Spinal Cord Tumors (Trattamento chirurgico dei tumori del midollo). P. Frugoni. *Chirurgia*, Milano, 1956, 11: 131.

The author reports his observations on the surgical treatment of 38 patients with intradural spinal cord tumors observed over the past 10 years. In this group there were 14 meningiomas and 24 intramedullary tumors.

The importance of early diagnosis before severe spinal cord symtomatology occurs is very important in the long term results from surgical treatment. Because of the slow growth and the extramedullary location, the meningiomas give the most favorable results.

Fourteen cases were observed by the authors from 3 months to 9 years postoperatively. There were no deaths and 13 of the patients had complete cures or major improvement, and in 1 there was less improvement. The dorsal and dorsal lateral location of the majority of these tumors does not present any surgical difficulty. However, when the lesion lies on the anterolateral portion of the spinal cord, there are usually secondary vascular changes in the spinal artery and the spinal cord changes are more likely to persist. Intramedullary tumors can be removed up to the level of the fourth cervical vertebra. These lesions can be resected by an incision through the dorsomedian raphe through which well localized lesions such as ependymomas can be resected from the surrounding spinal cord. The soft infiltrating tumors with necrosis and cystic changes cannot be removed without irreparable damage to the spinal cord. Good results are usually obtained following the surgical resection of ependymomas. The author presents an argument supporting the radical resection of intramedullary tumors below the cervical enlargement. He is of the opinion that the patient can be cured of these benign lesions, and although the latter is rendered paraplegic, the present day treatment of this condition has been satisfactory enough to warrant this radical approach. Among the 24 cases of intramedullary tumors observed by the author, there was one operative mortality. Of the 18 cases observed over 3 years, 16 showed marked improvement while 1 showed only moderate improvement.

The problem of recurrent symptomatology following surgical removal is discussed at length. In view of the difficulty presented by the differential diagnosis of adhesive arachnoiditis and recurrent spinal cord tumor, the patients should be explored surgically. The diagnosis of adhesive arachnoiditis should not be made unless the possibility of a recurrent tumor has been completely ruled out, and this can be accomplished only by surgical exploration.

—*Roland A. Manfredi, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Spontaneous Fractures of the Ribs. J. R. Von Ronnen. *Arch. chir. Neerl.*, 1956, 8: 251.

The so-called spontaneous costal fractures have been known for a long time. These fractures occur without an adequate trauma, and previously mentioned causes include bouts of coughing and sneezing, asphyxiation or strangulation, and defecatory straining. Fractures also occur in patients suffering from ordinary bronchitis, asthma, and even in normal subjects. Spontaneous costal fractures are also associated with marked osteoporosis or destructive processes of the ribs, and with osseous changes due to radio-ostitis.

Fractures of the first ribs are found chiefly in young men given to intensive physical training or whose occupations include regular lifting or carrying of heavy objects. As a rule these patients rarely present any symptoms, and in those cases in which symptoms do appear, they vary from sudden violent pain in the region of the shoulder or behind the shoulder blade to a dull ache during deep inspiration and pain on raising the arm. The mechanism is believed to be either an unusually increased action of the scalenus muscles when lifting and shouldering heavy loads or lateral traction exerted by the subclavian muscle, inserted in the first rib, and the upper branches of the anterior serratus muscle. Opposite forces applied to the first rib result in the fatigue fracture.

Fractures that result from prolonged coughing, strangulation, or vomiting usually occur in the middle ribs. According to one writer, cough fractures are localized immediately ventral to the insertions of the anterior serratus muscle (upper 8 to 9 ribs) or slightly dorsal to the insertions of the external oblique abdominal muscles (lower 8 ribs). Regular, recurrent, simultaneous, and increased contraction of both muscles (as occuring with chronic cough) is believed to give rise to fatigue fractures eventually. The long dorsal muscles are involved in the pathogenesis of fractures of more dorsal localization. Multiple fractures are encountered fairly frequently in the region of the fifth to eighth ribs. The sixth and seventh ribs are most frequently involved in patients with pulmonary tuberculosis.

Cough fractures are rare in the region of the lower ribs, though they have been described in women during the last few months of pregnancy. These patients presented no disturbances in the calcium-phosphorus metabolism. The cause of these fractures is believed to be hypertonia of the long dorsal muscles caused by a change in body balance. The change, caused by the heaviness of the uterus, promotes incorrect co-ordination and increased action in the long dorsal muscles, enhancing the shearing forces of the external oblique abdominal and the dorsal latissimus muscles.

Costal fractures resulting from radiation ostitis are found almost exclusively in patients who have received large doses of radiation or radium for the treatment of mammary carcinoma. The site of these fractures is usually in the anterior and the anterolateral parts of the first 6 ribs. These fractures usually do not give rise to subjective changes and are invariably associated with changes in the skin resulting from large doses of radiation. The mechanism is believed to be damage to the osteoblasts, and, as a result, an upset in the equilibrium between bone formation and breakdown in favor of the latter.

The author presents a series of most interesting cases which he has personally observed in detail; roentgenographs of these demonstrative cases also are included. —*James H. Holman, M.D.*

The Roentgenographic Picture of Hemangioma of the Rib (Il quadro radiologico dell'angioma costale). E. Properzi. *Chir. torac.*, 1956, 9: 563.

Vertebral hemangioma is well known, but the first case of hemangioma of the rib was reported in 1941. The author's case now makes a total of 6 cases reported in the literature.

The x-ray appearance of the condition is similar to that of vertebral involvement with fine reticulation, increased radiolucency, and longitudinal striations. There is a tendency toward the formation of a large angiomatous mass which may project into the chest cavity or externally. Pathological fracture is to be expected as well as hemorrhage. Localization by planography is helpful but the roentgenogram is quite characteristic. —*Warner F. Bowers, M.D.*

Antibiotic Attenuated Chronic Staphylococcal Abscess Simulating Early Carcinoma in the Lactating Breast. Thomas F. Rose. *Med. J. Australia*, 1956, 42: 567.

The author describes 3 cases of antibiotic attenuated staphylococcal abscess following acute puerperal mastitis which apparently was successfully treated by the appropriate antibiotic. Each patient had a hard, fairly well encapsulated swelling deep in the breast, which on close questioning was admitted by the patient to have been the site of the previous mastitis. Each gave a history of cracking of the nipple and painful swelling of a segment of the breast which responded to antibiotics. The masses reappeared 2 to 3 months after delivery and resembled carcinoma. Wide excision for biopsy and culture revealed the true nature of the lesions. —*Edmund R. Donoghue, M.D.*

Bilateral Breast Cancer (Considerazioni su 100 casi di cancro bilaterale della mammella). P. Bugalossi, V. C. Catania, and T. Rock. *Tumori*, Milano, 1956, 42: 538.

The authors report 100 cases of bilateral breast cancer in which operations were performed from 1928 to 1955. During this time 3,600 patients with breast cancer were seen. Of these, 197 developed bilateral breast cancer, but only 100 of these were operated upon. In 26 cases the cancer was observed simultaneously in both breasts, while in 74 the cancer was noted at different periods.

Numerous factors were studied in an attempt to explain the incidence of bilateral cancer, but no explanation was found. Several conclusions were derived from this study. There was a longer menstrual life in the patients with bilateral cancer. The site of occurrence in the different breast quadrants was unrelated to the classical routes of lymphatic spread. Patients with involvement of the lymph nodes along the internal mammary artery had a much more serious prognosis. The 5 year survival rate in patients with bilateral cancer did not differ from that in those with unilateral cancer. The survival rate is dependent upon the invasion of the lymph nodes.

After studying their own cases and reviewing the literature the authors conclude that prophylactic removal of the healthy breast does not improve the 5 year survival rate. —*Lucian J. Fronduti, M.D.*

Hormones in the Treatment of Cancer of the Breast and Prostate, with Special Reference to the Adrenal Gland. L. N. PYRAH. *Brit. J. Surg.*, 1956, 44: 69.

IN THIS WEILD LECTURE given at Glasgow, the author tersely reviews the accumulating evidence that cancers of the breast and prostate are often hormone-dependent. Most work, so far, has dealt with the relationship of estrogens and breast cancer. In 1916 Lathrop and Loeb showed that in a cancer-bearing strain of mice the removal of the ovaries before the age of 6 months significantly reduced the incidence of mammary cancer and also caused the cancer to appear at a later age than in nonoophorectomized controls. In 1932 Lacassagne produced mammary cancer within 6 months by injecting estrin into the male mice of a strain in which the females had a high incidence of spontaneous mammary carcinoma. Previously (1928), Murray, using a strain of mice in which cancer of the breast developed spontaneously in 80 per cent of the females but in none of the males, had found that after castration and implantation of an ovary the incidence in the males rose. In 1939 Woolley, Fekete, and Little noted the return of irregular cycles of estrus in mice that had been spayed the day of birth. They hypothesized that the adrenal glands secreted the responsible estrogenic chemical. Gardner in 1941 likewise noted in spayed mice the development of vaginal and uterine epithelial changes compatible with estrogenic activity. Some of the animals were also noted to have developed adrenal tumors.

At the clinical level, Herrell in 1937 found the incidence of cancer of the breast prior to bilateral oophorectomy to be 1.5 per cent in 1,906 patients while in a control group of 1,011 women of similar age it was 15.4 per cent. In 1947 Horsley reported a higher incidence of 5 year cures in those treated initially by bilateral oophorectomy and radical mastectomy as compared to those treated with radical mastectomy only.

The first clinical employment of hormonal therapy in cancer of the breast was undertaken in 1896 by Sir George Beatson who reported clinical improvement after removal of the ovaries in 2 or 3 patients with far advanced mammary cancer. By 1905, 99 such operations constituting an indirect attack had been reported. Of 75 premenopausal patients, 22 manifested objective improvement; of the 24 postmenopausal patients, however, only 1 was objectively benefited. More recently, Pearson *et al.* (1955) have found objective remissions averaging 9 months in 44 per cent of 75 premenopausal women with metastasis from mammary cancer and in only 10 per cent of 21 postmenopausal patients. In 7 of 18 premenopausal patients with advanced mammary cancer, the author and his colleagues have noted a response to bilateral oophorectomy. Usually of short duration, the remission was longer in 3 of the patients.

In the male, Treves (1949) noted remission in 3 of 6 patients with metastatic mammary cancer. Irradiation of the ovaries similarly benefited 47 of 304 premenopausal patients (Adair, 1945) and 36 of 175 patients (Douglas, 1952). The latter group received 750 roentgens in one week.

Why does a cancer that has once regressed upon removal of hormonal stimulus later relapse? Is it because the cancer loses its hormonal dependence, becoming autonomous? Or is it again activated by fresh hormone released from elsewhere in the body, perhaps from activated glandular "rests?"

Such concepts led Huggins (1951) to perform adrenalectomy in addition to castration, and Perrault (1952) and Luft *et al.* (1955) to perform only hypophysectomy. In addition to destroying the source of gonadotropic stimulation of estrogenic activity, hypophysectomy prevents secretion of the growth hormone which may well stimulate tumor growth directly.

Between April, 1953 and November, 1955, Pyrah performed bilateral adrenalectomy with oophorectomy or orchidectomy in 53 patients with advanced mammary cancer. The patients were prepared for surgery with cortisone and deoxycortone acetate. After the sixth postoperative day, only the cortisone (25 mgm. twice a day) is supplemented. The author prefers the posterolateral approach to the adrenal glands and a midline subumbilical approach to the ovaries. If the patient is reasonably fit all three incisions are performed at the one sitting. Twenty-three cases of the 53 were so managed.

Twenty-four patients were significantly benefited. Of these, 9 are alive and well, 5 are alive but now the condition is relapsing, 7 subsequently relapsed and died, and 3 have died of other causes.

Twenty-four patients were not benefited. Of these 6 died postoperatively, 14 have died of the cancer, and 4 remain alive but without benefit. An additional 5 patients are alive and well, but the surgery is too recent for assessment.

Among 7 patients with prostatic cancer that again became active after initial control by antiandrogenic measures, and who were then adrenalectomized, Pyrah noted only 1 short remission.

—*Everett Shocket, M.D.*

Mammary Carcinoma; Conclusions Concerning Its Growth Based on Clinicobiochemical Observations of Hormonal Therapy (Das Mammacarcinom, Rueckschluesse ueber sein Wachstum auf Grund klinischbiochemischer Beobachtungen bei hormonalen Therapieversuchen). SIEGFRIED V. NIDA. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 281: 351.

ON THE BASIS of changes in the mineral metabolism produced by various hormones used in the therapy

of carcinoma of the breast, several hypotheses have been formulated concerning the role of various chemical factors, such as magnesium, in this neoplasm. The reciprocal relationship between calcium and magnesium concentrations is pointed out and correlated with the occasional presence of calcium deposits in the center of tumors. This would be reflected in a higher magnesium concentration at the periphery of the tumor and, in turn, a low level in the serum and erythrocytes. The author has found this to be true. As the carcinoma increases in size, the magnesium level falls. With extirpation of the tumor, this effect is reversed. Experimental observations in patients receiving hormonal therapy for cancer of the breast have shown a correlation between an increase in the magnesium blood levels and clinical improvement.

This finding seems to indicate a disturbance in the metabolic exchange between the cells and interstices of the paracarcinomatous tissue. In the areas with the greatest disturbance the neoplastic cells proliferate.

The author suggests that the hormonal effect on the electrolyte metabolism produces an alteration of the biochemical milieu of the cell, which in some way is related to the genesis and growth of the carcinoma. He presents additional theoretical considerations to support this view and correlates the biochemical effects of various hormones with their effect on the patients with mammary carcinoma.

—J. C. Rosenberg, M.D.

Hypophysectomy in the Treatment of Advanced Cancer of the Breast. Bronson S. Ray and Olof H. Pearson. *Ann. Surg.*, 1956, 144: 394.

The authors report their experience with 75 hypophysectomies in 74 women over a 22 month period from March, 1954 through December, 1955. The patients selected had advanced active spread of the breast cancer as evidenced by palpable or visible metastases, radiologically visible metastases to the bones and lungs, or pleural effusion containing cancer cells. More than a third of the patients were hypophysectomized after castration alone or after castration combined with adrenalectomy had been performed. At the time of hypophysectomy, however, any beneficial effect of previous irradiation or endocrine treatment had ended. The operative procedure is described briefly and the cortisone replacement requirements following hypophysectomy and in the immediate preoperative period are outlined. If hypophysectomy was complete thyroid deficiency developed and required 120 mgm. of desiccated thyroid daily. In only 5 of the 74 patients was there evidence of incomplete removal of the gland.

Advance of the disease was arrested in 8 cases and there was recognizable regression in 28 cases. In addition to remission of the disease in nearly half of the cases, the average survival period following hypophysectomy was more than twice as long (9.3 months) as in cases without remission of the disease. The average length of remission, however, was only 7 months. Remission followed hypophysectomy only in those cases that previously showed remission from castration and adrenalectomy, which suggested that hypophysectomy can be added to the beneficial effects of a previous glandular ablation.

Somewhat contrary to previous reports in the literature, the authors found a remission in several patients more than 60 years of age. Complications following hypophysectomy were relatively few, the case mortality was only 10 per cent, and the mortality due to the operation was less than 5 per cent. The results suggest that if hypophysectomy is not used as the primary procedure in the treatment of advanced breast cancer it is preferable to adrenalectomy as a second operation following castration.

—Roger D. Williams, M.D.

Metaplastic Processes Resulting from Noxious Influences in Osteoid Sarcoma of the Breast; Secondary Structure of Malignant Tissues. (Metaplastische Vorgaenge durch Noxine im Osteoidsarkom der Mamma als sekundaere Strukturen malignen Gewebes). G. Burkhardt. *Arch. Geschwulstforsch.*, 1956, 10: 22.

The author's observation of an osteoid-sarcoma in a 70 year old diabetic female forms the basis of this report. The tumor was located on the undersurface of the right breast, was of firm consistency and firmly adherent to the overlying skin. Histologically it consisted of a polymorphous cellular sarcomatous tissue which included spindle cells and giant cells. Portions of the tumor contained polymorphic leukocytes and areas of necrosis. Throughout the tumor irregular osteoid tissue could be seen. This tumor was removed locally, at which time no connection with the ribs was found. Recurrence of the tumor was treated by x-ray therapy with no effect. A radical surgical excision of the breast was therefore performed. Pathologic examination confirmed the previous finding of a bone-forming sarcoma of the breast.

In an attempt to explain the presence of such a tumor in mammary tissue, various theories of neoplasia were reviewed. Cohnheim's contention that all tumors arise from ectopic embryonic remnants has been shown to be true in only a small number of instances. Though they have many common properties, embryonic and tumor cells are far from being one and the same. It therefore must be assumed, in order to accept Cohnheim's hypothesis, that ectopic embryonic cells undergo some form of degeneration or mutation to become tumor cells. The similarity of tumors to regenerating or inflammatory tissue was also noted and speculated upon. The occurrence of metaplasia also was discussed, especially as it pertained to the formation of bone in calcified areas arising from necrotic tissue, especially of an infectious or hemorrhagic nature.

The possibility that the osteoid-sarcoma represents a differentiation of the tumor cells themselves, by which the sarcoma cells become osteoblasts, was considered. Another possibility was that the stroma of the tumor underwent metaplasia due to inflammatory processes induced by tumor necrosis. The poor blood supply of the area involved by the sarcoma, the age of the patient, and the presence of diabetes would favor the occurrence of such a metaplasia. On the basis of the microscopic findings, the author believed this to be the most likely explanation for the occurrence of this osteoid-sarcoma. The fact that irradiation resulted in some

increase in bone formation was also taken to mean that necrosis of the tumor secondarily induced the metaplasia. —*J. C. Rosenberg, M.D.*

The S. Standard Operation for Edema Following Radical Mastectomy (L'operazione di S. Standard per la cura dell'edema dell'arto superiore conseguente a mastectomia radicale). REMO BERTOLOTTO. *Fracastoro*, 1956, 49: 297.

THE AUTHOR reports the case of a patient with massive edema of the left upper extremity following radical mastectomy, with follow-up x-ray therapy. The patient was operated upon in 1942 and each year for four years after she received a course of x-ray therapy (the dose was not given). In 1948, the patient began to develop a progressive edema of the entire upper extremity with marked functional impairment. There was no response to physical therapy.

Surgical intervention was resorted to in 1954 when the arm was sutured to the chest wall after longitudinal incisions were made in the chest wall and the medial aspect of the arm. The incisions were carried down to the superficial fascia which was partially excised. The wounds were closed with everting sutures of the anterior and posterior margins (S. Standard procedure). There was steady improvement for eighteen months.

The favorable results with this procedure are diminution of the edema and return of function, even though limited. The unfavorable result is the permanent anchoring of the arm to the chest wall.

The author believes that this procedure should be considered when other methods of treatment have failed. —*Lucian J. Fronduti, M.D.*

TRACHEA, LUNGS, AND PLEURA

Bronchography Under General Anesthesia (Die Bronchographie in Narkose). HH. LÖHR, E. SCHERER, H. SCHOLTZE, and F. KOOTZ. *Thoraxchirurgie*, 1956, 4: 233.

WITH THE RAPID development of thoracic surgery, diagnostic procedures such as bronchography, bronchoscopy, laminography and pulmonary angiography, which make possible determination of the nature of a lesion and its location and extent, have become increasingly important.

Bronchography usually is performed under local anesthesia, the advantages of which are known and frequently emphasized in the literature. The use of general anesthesia for bronchography was first suggested by Hollis in 1929. Many advances have been achieved since, and now it is an efficient and safe procedure.

According to their experience with 200 bronchographic examinations under local and 200 under general anesthesia, the authors have established absolute and relative indications for the use of general anesthesia.

In co-operation with a well trained and experienced anesthetist bronchography under general anesthesia can be performed in complete darkness. To avoid confusing the remaining bronchial secretion with organic irregularities of the bronchial wall, the bronchial tree can be cleaned sufficiently by means of suction. Complete calmness of the patient provides technically excellent films. Furthermore, opacification can be repeated, additional selective studies of different segments made, or bronchoscopy performed at the same sitting without further discomfort to the patient. Toxic and allergic reactions due to local anesthetics are avoided, and maximal safety can be provided for patients having bronchial asthma by employing deep ether anesthesia. According to Schostock (1953) a decrease in respiratory function does not occur under general anesthesia, as it is known to do in bronchography under local anesthesia. The planned operation can therefore be performed without further delay. On the other hand, the relative magnitude of the procedure, requiring an experienced anesthetist, additional personnel, sufficient time and adequate equipment, confines the performance to great centers of thoracic surgery. In addition to the risk of general anesthesia per se, observation of a curarized patient in a dark room presents difficulties; chronic hypoxia and hypercapnia may develop if ventilation is not adequately maintained. This is true particularly of children, in whom there is not much space for oxygen administration once the "Metrascatheter" is in place. In patients with allergic diathesis reflex bronchospasm may occur as a result of the effect of morphine or barbiturates, or from local stimulation by the contrast agent if anesthesia is not deep enough.

In the presence of tuberculous disease special precautions are indicated. In 14 of 45 patients having tuberculous lesions elevation of the temperature to 39.2 degrees centigrade has been observed. Usually it subsided within the course of 1 week. However, in 1 patient, a 12 year old girl, a massive spread occurred which required 1 year of conservative treatment to be controlled. It is not clear whether bronchography or the operation that followed immediately was responsible for the event, but it is emphasized that patients with tuberculosis should not be subjected to bronchography unless strong indication justifies the procedure.

General anesthesia should be employed in the following circumstances:

1. In nervous, sensitive, and immobilized patients. In these it is wise to perform bronchoscopy at the same sitting.

2. In children. In 8 children, 1.5 to 12 years of age, bronchography under general anesthesia was successfully performed.

3. When it is necessary to repeat bronchographic examinations. In 35 patients, bronchography was repeated under general anesthesia and at the same time further bronchoscopic studies were performed.

4. When wet lungs are present. In this group of cases hyperemia of the bronchial mucous membranes causes rapid absorption of local anesthetics and increases the danger of intoxication. In addition, the mucus covering the bronchial air ways cannot be removed sufficiently under local anesthesia. The anesthetics therefore are prevented from coming in contact with the mucous membranes and cough attacks may occur. The experience of the authors with this group of patients comprise 24 cases of bronchiectases (7.5 to 63 years of age), 22 cases of lung abscesses and gangrene, 9 patients with lung cysts or sequestration

of the left lower lobe (15 months to 49 years of age), and 5 patients with nonspecific postempyemic cavities, with or without bronchopleural fistulas.

5. If tuberculous lesions are to be demonstrated by bronchoscopy, general anesthesia should be employed routinely, since considerable technical difficulties, resulting from previous processes of the disease or surgical procedures, and requiring time and relaxation of the patient, have to be anticipated. Visualization of tuberculous cavities or draining bronchi carries much too high a risk to justify the procedure. If resection is planned, bronchography should be employed to exclude bronchiectasis in the surrounding parts of the lung which would make the operative result doubtful. In 9 cases bronchography was employed to exclude bronchial stenoses. Stenotic processes following tuberculous bronchitis are irreversible. If decortication of an immobilized pneumothorax lung is considered, one should know whether the bronchial tree will provide adequate ventilation after operation.

In the cases of tumors of the lung or mediastinum, the relative indications were based on psychologic reasons in 32 selected cases, and bronchoscopy and biopsy were performed at the same sitting. The localization of intrapulmonary foreign bodies after long lasting disease processes associated with shrinkage, atelectasis, or emphysema of neighboring parts of the lung can present considerable difficulties, requiring time and relaxation of the patient. Bronchiectasis, abscess cavitation, and distortion of the bronchial tree also can be demonstrated. Of 5 patients selected for bronchographic studies under general anesthesia, a bronchopleural fistula could be demonstrated in two.

—*Erwin Simandl, M.D.*

The Clinical Value of Analysis of Lung Function in Some Intrathoracic Diseases; a Spirometric, Bronchospirometric, and Angiopneumonographic Investigation. LAWE SVANBERG. *Acta. chir. scand.*, 1956, 111: 169.

IN EVALUATING lung function, the best information is obtained from physiologic examination of the factors that contribute to the gaseous exchange between the atmosphere and the blood. There are 3 main components of lung function: the venilation, which is the passage of gases to and from the alveoli; the diffusion, which is the exchange of gases across the alveolar membrane; and the circulation, which is the transport of blood to and from the lungs.

In the present study, spirometry, bronchospirometry, and angiopneumonography were used to determine the capacity, function, and vasculature of the lungs and of each lung separately. Observations on a limited number of intrathoracic diseases make up this report.

In studying diaphragmatic insufficiency the author found that in the patients with the least diaphragmatic contractibility and in the cases of diaphragmatic eventration, the venilation and the oxygen uptake on the affected side of the diaphragm was best in the upright position or in the lateral position with the affected lung uppermost. This is the opposite of that seen in the normal person in whom the venilation and the oxygen uptake is best in the dependent lung in the lateral position. Also in other cases of diaphragmatic insufficiency, the effects of posture can be opposite that found in the normal person. If the affected leaf of the diaphragm has assumed a higher position in the thorax, ventilation is usually adequate; but if it is immobile because of adhesions or maintenance of tension, ventilation is reduced and angiopneumonography shows a decrease in the basilar circulation.

In studying patients with bronchiectasis and emphysema, bronchospirometry and angiopneumonography find a high degree of usefulness and provide valuable clinical information about the functional state of each lung and of the lobes and segments of each lung.

In patients with bronchial cancer, a close correlation was found between the test findings and the operative findings. Bronchospirometry was of value and showed that it is possible to carry out a radical operation in any patient in whom the oxygen uptake of the affected lung was reduced by 50 per cent. Angiopneumonography showed the involvement of the pulmonary artery or arteries to a corresponding extent.

In patients with a funnel chest, spirometry showed no characteristic changes in lung volume. However, in those patients in whom the heart was displaced to the left, bronchospirometry showed a decrease in oxygen uptake by the right lung. The author believes that bronchospirometry should be carried out in all patients with a funnel chest in whom the heart is displaced to the left.

Finally, it was in patients with mitral stenosis that the angiopneumonographic tests were of most value. If the changes in the pulmonary vascular bed are pronounced, the relief to be expected by operation is limited because of the organic changes which are irreversible.

Thus the author found that the combination of spirometry, bronchospirometry, and angiopneumonography gave valuable information regarding the functions of the lungs, lobes, and segments, as well as of their vasculature. —*John J. Bergan, M.D.*

Hydatidosis with Particular Regard to Pulmonary Localization (La nostra esperienza nel campo dell' idatidosi con particolare riguardo alla localizzazione polmonare). PASQUALE FICARA. *Chir. torac.*, 1956, 9: 477.

THE AUTHOR reviewed the cases of 142 patients with echinococcal infestation who were operated upon in the civil hospital of Aquila in the period from 1940 to 1954. In 65, or 45 per cent, of these patients the infestation was localized in the lung, and in 58, or 40 per cent, in the liver. In the remaining patients it occurred or developed later in various other organs. The parasite is believed to develop in the endoalveolar area of the bronchioles.

During the 14 year period various forms of therapy were used. In the beginning marsupialization was used. Recently, excision of the cyst with primary closure according to Posadus and pericystectomy according to Perez-Fontana have been done. The author has resorted to excision of the cyst in 46 cases, which procedure represents his method of choice at present. He has resorted to pericystectomy in only a few cases and his experience with this method is limited. —*Lucian J. Fronduti, M.D.*

The Treatment of Lung Cancer; Indications and Results. HANS RAHBEK SØRENSEN and FREDERIK THERKELSEN. *Acta. chir. scand.*, 1956, 111: 239.

THE RESULTS of the treatment of 732 patients during the period from 1942 to 1955 at the Rigshospitalet, Copenhagen, are reviewed by the authors. The patients were grouped according to whether they were treated before or after January 1, 1950.

Inoperable cases accounted for 62 per cent of the overall group. During the earlier period one-third of the patients underwent exploratory thoracotomy. One-half of the patients in the inoperable group had thoracotomies in the later group (after January 1, 1955). This was explained on the basis of a difference in patient material and indications for the operation. Inoperability was difficult to predict unless obvious evidence of metastases was present, or if bronchoscopy revealed tumor spread beyond the level of the carina. Tomographic evidence of mediastinal adenopathy was not felt to be tantamount to inoperability, since such enlargement could be inflammatory in nature rather than metastatic.

The total number of operable cases has increased from 26.7 per cent to 46.6 per cent over these years. Operability refers to those patients subjected to either lobectomy or pneumonectomy. The authors believe that this improvement was due in part to the earlier arrival of the patient for treatment; however only one-half of the patients had symptoms for less than 6 months and one-fifth had them for more than a year.

The operative mortality was high because of an active therapeutic attitude at this institution. During the later period the mortality rate was 16.6 per cent, with pneumonectomy accounting for twice as many deaths as lobectomy. The most common cause of death was pulmonary embolism; less common were circulatory failure and infection.

Survival rates were influenced by a number of different factors. The overall 5 year survival for discharged pneumonectomized patients was 35 per cent. Histologic type of the tumor played a major role in the survival rates. Anaplastic carcinoma affords an extremely poor prognosis. The longest survival period was 19 months. Other reports have given results as good as 20 per cent of 5 year suvivors in this group, and the authors believe that the histologic classification influences such statistics. Adenocarcinoma has a more favorable outlook, and squamous cell growths carry by far the best prognosis (over 40 per cent of 5 year survivors).

Survival rates are also strongly affected by the presence or absence of lymph node metastases and their extent. Forty-five per cent of the group without evidence of lymph node spread survived 5 years, while only 1 of 4 patients with hilar spread survived this time interval. No patient who had mediastinal node involvement lived over 2 years.

Age plays an important role in the survival rate. The 5 year survival rate for patients under 60 was 30 per cent higher than that for the group in the 60 to 70 age range. The authors believe that carcinoma in the older patients is generally a more malignant form and more advanced. No patient over 70 years of age survived for more than 2 years, with the average survival time being 6 months.

Intrapericardial dissection was performed only when the extent of the disease demanded it. For this reason such a procedure carried a poorer prognosis than the series as a whole, but the difference was not marked. The point was made that extension as observed grossly may often prove to be inflammatory rather than neoplastic, and for this reason the extension of operative procedures does not always influence the prognosis appreciably.

The survival rates were better after pneumonectomies than after lobectomies. Here again the reason for the choice of the type of procedure is important. Lobectomy was used for small peripheral lesions with a good prognosis, as well as for far advanced lesions in which a more extensive procedure was impossible. The higher operative mortality in the patients having pneumonectomy reduces the advantages noted in terms of survival rates when the overall result is considered.

The best prognostic group was made up of patients under 70 years of age with squamous cell carcinoma restricted to the lung. Here the 5 year survival rate was 65 per cent.

The authors stress the importance of the early recognition of the disease. Propaganda campaigns are of aid in educating both physician and public and more improvement is possible along these lines. When patients arrive for treatment earlier there is a chance for higher operability rates. Also more lobectomies will be possible, which will further reduce the operative mortality.

—*M. C. Anderson, M.D.*

The Experience of Bronchiogenic Carcinoma at the Department of Surgery, Sabbatsbergs Sjukhus. THURE WIKLUND. *Acta chir. scand.*, 1956, 111: 251.

THE INCIDENCE of bronchogenic carcinoma appears to be on the increase in many countries. The author thinks that such a trend, if present, is very moderate in Sweden.

In 1953, 398 cases of bronchogenic carcinoma were reported with a heavy preponderence of the disease in the male population. Also there was noted a remarkably higher incidence in urban compared to rural communities. This increase resulted from a disproportionate rise in the number of cases in males; the incidence in females remained relatively constant regardless of habitat and possibly represented the natural incidence. On the other hand, men are more exposed at their work to various irritating substances which lead to carcinoma.

The author considers the bronchoscope to be the most valuable instrument in the diagnosis of cancer of the lung. Over the period from 1946 to 1954, 661 cases were studied at the Sabbatsbergs Sjukhus, Stockholm, Sweden, and 68 per cent could be verified by bronchoscopy. An additional 15 per cent of the patients had an abnormal tracheobronchial tree, but definite histologic confirmation could not be obtained. Thus, only 17 per cent showed no abnormality on bronchoscopy. This figure correlates well with the accepted figure for peripherally located lesions. The figures given for diagnosis by bronchoscopy are better than most, and the author attributes this to an excellent team of bronchoscopists, as well as to the extensive use of the procedure in this hospital.

The aspiration method for biopsy should be used only in obviously inoperable cases in which diagnosis cannot be established by other means. The danger of implanting tumor along the needle tract is a contraindication to the use of the procedure in any other situation.

The author admits having little experience with cytologic studies of sputum. Because of the excellent results obtained by bronchoscopy there has been little need for such a method.

Roentgenology has played an important role in the diagnosis of pulmonary disease; however, it is uncommon to make an absolute diagnosis by this method alone. For example, the x-ray film may show bronchial stenosis but will not define its cause. Approximately 25 per cent of the peripheral coin lesions prove to be malignant when removed, and for this reason thoracotomy is indicated.

Exploratory thoracotomy and bronchoscopy are believed to be the two most reliable diagnostic procedures. The author believes thoracotomy is indicated in any doubtful case to avoid overlooking bronchogenic carcinoma.

In principle the author believes that pneumonectomy and the removal of the hilar nodes is the best procedure. By means of mass radiography an increasing number of patients with small, silent peripheral tumors have been operated on in recent years; in these instances lobectomy is an accepted procedure.

The operative mortality has fallen from 29 per cent (1935 to 1945) to 10.8 per cent in the last 9 years. The lowest mortality rate during this latter period was 5 per cent in 1952.

Prior to the era of antibiotics, empyema was the main cause of operative mortality. More recently circulatory failure and pulmonary embolism have become the main factors. Circulatory failure actually remained high during all periods, and this is attributed to the age and general physical status of the patient harboring such a disease. Pulmonary embolism was surprisingly high on the list of causes of death, and this may have been due to the use of a cannula in the saphenous vein for several days after surgery; this practice has now been discontinued.

The author believes that bronchogenic carcinoma will become a more important problem in the future. All possibilities of establishing an early diagnosis are being pursued to their fullest, including education of the physician and patient, as well as mass radiographic screening. The great hope centers around the isolation of the responsible agents which resulted in the present increased incidence. —*M. C. Anderson, M.D.*

Primary Reticuloendothelial Sarcoma of the Lung (Das primaere Retothelsarkom der Lunge). WOLFGANG SCHÜTZ and KURT KÖHN. *Thoraxchirurgie*, 1956, 4: 272.

THE AUTHORS report on one of the rare cases of a primary retothelioma of the lung. The patient, a 41 year old male, had a history of chronic bronchitis for several years. An episode of cough and expectoration in March, 1955, subsided spontaneously. A similar episode of cough, expectoration, moderately elevated temperature, and herpes labialis occurred in June, 1955, and was followed by pleurisy. A tuberculous lesion was suspected and the patient admitted to a tuberculosis hospital. X-ray examination revealed a band-shaped atelectasis above and along the left margin of the heart. A bronchogram showed the stem bronchus of the left lower lobe to be obstructed 6 centimeters distal to its origin from the main left bronchus. The left lower lobe, with the exception of its apical segment, was atelectatic. On bronchoscopy, the orifice of the stem bronchus of the left lower lobe appeared to be constricted by a surrounding tissue formation of pale and dense appearance, exhibiting only little bleeding tendency. A biopsy specimen of this tissue was taken. The section was thought to represent a bronchial adenoma, but a malignant condition could not be excluded with certainty. No abnormalities of the blood picture were found.

On August 17, 1955 the patient was transferred to the surgical clinic of the University Hospital in West Berlin. The tumor was believed to be a malignant one, and on September 1, 1955 a pneumonectomy was performed.

Examination of the specimen showed the left upper lobe to be emphysematous, whereas the left lower lobe was occupied almost entirely by a grayish-white tumor mass of fish-meat appearance. There was only a small band of normal lung tissue left at the upper margin of the lobe. The stem bronchus was completely occluded by the tumor mass. Only a few hilar lymph nodes were infiltrated with tumor cells. Microscopically the diagnosis of reticuloendothelial sarcoma was made on the basis of the striking proliferation of a network of argyrophil fibers demonstrated by the Oliveira method.

A tumor that arises in the hilar lymph nodes would expand widely in the mediastinum and scarcely involve a whole lobe of the lung. In this case the limited involvement of the hilar lymph nodes represented metastases rather than continuous tumor growth. The authors, therefore, believe that the findings are consistent with those of a primary reticuloendothelial sarcoma of the lung. Since the matrix for a reticuloendothelial new growth is represented by the ubiquitous periadventitial "active mesenchyma" (O. Fresen), such new growth is not confined to preformed lymphatic tissue, but can occur in any organ. Reticuloendothelial sarcomas have actually been demonstrated in the uterus (G. Lugo, 1954) and in the brain (G. Wilke, 1950 and 1951). Furthermore, primary reticuloendotheliosis of the lung in the form of lymphogranulomatosis is well known. M. Versé collected material from 13 such cases in 1931. If there is acceptance of the existence of primary lymphogranulomatosis of the lung, there must be also the possibility of the eventual occurrence of primary retotheliomas of this organ. According to Dudits, W. Fischer, Köhn, Werner, Landschuetz, and Kausche transformation of a lymphogranuloma into a retothelioma is not extremely infrequent, although it has been doubted by other authors (Fresen and Ruettner).

The history and symptomatology of the case in question do not differ from that of a carcinoma. Lenk has pointed out that sarcomas usually grow more rapidly than carcinomas, while Brunner, Verstraten, Boels, Nilsson, Braun, Drewes, and Willman have reported preoperative histories of periods of 1 to 5 years' duration. There is no agreement in the litera-

ture as to metastases. Sarcomas of the lung are frequently said to metastasize considerably later than carcinomas. However, in the case presented, lymph node metastasis was present after a history of only 6 months' duration.

Radiologically, in the early stage the sarcoma appears as a structure with well defined, round outlines and can be easily confused with a benign tumor. Biopsies are frequently not conclusive. Since the malignant nature of a tumor, particularly in an early stage, is difficult to determine, the authors emphasize exploration in any case of suspected malignancy.

—*Erwin Simandl, M.D.*

Heart Catheterization and Selective Angiography of Pulmonary Vessels in the Preoperative Diagnosis of Function in Pulmonary Surgery (Der Herzkatheterismus und die selektive Angiographie der Lungengefaesse in der praeoperativen Funktionsdiagnostik der Lungenchirurgie). R. SEMISCH, H. KÖLLING, and H. H. WITTIG. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 283: 193.

THE INDICATIONS for the resection of pulmonary segments include, in addition to the nature and extent of the lesion, the evaluation of function of the remaining lung parenchyma and the efficiency of the right side of the heart and the lesser circulation. The development of a chronic pulmonary-cardiac disease after the operation should be prevented. A successful segmental resection is hardly justified if the patient dies within a short time from cardiopulmonary insufficiency. Therefore, the operation is contraindicated if the results of the preoperative analysis show probability of such insufficiency.

In the preoperative analysis the authors included catheterization of the lesser circulation and selective angiography. Under fluoroscopic control the catheter was introduced through the left basilic vein into the artery of the lobe or segment. Five to 15 cubic centimeters of contrast medium were injected and the pictures were taken. Later the blood pressures were measured in the right side of the heart and in the pulmonary artery. The gas content of blood in the right side of the heart, in the lesser circulation, and in one of the peripheral arteries was computed.

In a healthy person an increase of the heart minute volume up to 300 per cent does not influence the pressure in the lesser circulation. However, if there is a considerable loss of lung parenchyma (emphysema, tuberculosis, tumor), the adjustment potentialities are lost.

A high pressure in the lesser circulation at rest indicates that a chronic pulmonary-cardiac disease (cor pulmonale) may develop after surgery. Upon evaluation of all other findings the authors considered the systolic pressure of 35 mm. Hg. adequate for surgical intervention. A pressure higher than 45 mm. was considered a contraindication.

The selective angiography was employed for the evaluation of the efficiency of the right side of the heart, the function of the circulation, and the remaining lung parenchyma. It permitted the visualization of the diseased portions of the lungs and/or the visualization of the unaffected portions of the lungs. It also disclosed the narrowing of the vessels in some cases in which normal blood pressures were registered in the lesser circulation.

The authors discuss 8 well illustrated cases in which selective angiography, in addition to pressure measurements, was employed. Seven patients had tuberculosis and 1 had carcinoma. Two patients were considered unsuitable for surgery, 1 because of the possibility of a still active process in the other lung and the other because, in addition to the tuberculosis of the left upper lobe, there was considerable emphysema of the lower lobe. The pressure in the pulmonary artery was 40/13 mm. and in the right ventricle 36/4 mm., while 25/10 mm. and 25/0 mm., respectively, are considered normal. These findings indicated the beginning of the insufficiency of the right side of the heart.

—*Victor R. Jablokow, M.D.*

Indications and Results in Lung Surgery as Revealed by the Functional Study. FRANK BERGAN. *Acta. chir. scand.*, 1956, 111: 214.

IT SHOULD BE OBVIOUS that the objectives of thoracic surgery are to treat the patient efficiently, to reduce pulmonary function very little or increase it, and to keep down the operative mortality. A frequent question has been the possibility of evaluating the borderline case in objective terms regarding operability. None of our present methods alone define this lower limit of operability. To be able to make a decision regarding operability, the clinician must have information regarding the case history, the result of x-ray examinations, the patient's general condition, and a knowledge of the pathologic anatomy. In addition, the function of the diaphragm, the details of pulmonary function in relation to age, and other factors must be known.

Not only the choice of operative procedure, but the patient's postoperative course must be considered. Such complications as atelectasis or slight paradoxical movement might be fatal to a patient with impaired pulmonary function. Timely bronchoscopy with suction, tracheotomy, or artificial respiration may be lifesaving procedures.

Investigations have shown that the loss of function following thoracotomy alone is so small as to be insignificant. On the other hand, resection of lung tissue will reduce the function by an amount roughly correspondent to the amount of resected functioning tissue. The loss of function following thoracoplasty has been established to be about 18 per cent of the vital capacity for a 5 rib thoracoplasty.

The problem of whether distention of the remaining lung tissue following resection leads to a decrease in function has not been solved. In deciding whether or not to do a thoracoplasty, the major consideration should be a reduction in the spread or flare-up of the disease.

Decortication will, in general, improve the cardiorespiratory function. This is true if the lung tissue itself has not been damaged by fibrosis, infiltration, emphysema, or bronchiectasis.

In patients with pulmonary cancer an accurate evaluation can be made by utilizing bronchospirometry to predict the postoperative effects of pneumonectomy. It should be mentioned that, in pneumonectomies on the left side, phrenic avulsion probably

should not be carried out because of the effects of torsion on the stomach. —*John J. Bergan, M.D.*

Indications for and Results of Thoracic Surgery with Regard to Respiratory and Circulatory Function Tests. L. G. Uggla. *Acta. chir. scand.*, 1956, 111: 197.

Since pulmonary hypertension is becoming a problem of increasing importance in thoracic surgery, it is equally important to know before surgery how a given patient will react after extirpation of a part of his functioning vascular system.

Cor pulmonale has become a problem in recent years because fewer patients are dying in the early, toxic phases of pulmonary tuberculosis. Thus time for the advent of pulmonary hypertension is allowed.

Because it has been impossible to estimate the extent of pulmonary hypertension by conventional means, the method of Carlens *et al.* was used in this study. This method involves the occlusion of the pulmonary artery with the inflatable cuff of a catheter and the recording of the pressure in the artery proximal to the occlusion.

The material for the study consisted of 109 patients who were referred for evaluation. All were borderline cardiorespiratory cases. Of the total, 101 had bilateral lesions and 50 had undergone thoracoplasty.

The patients were divided into 3 groups: those who died, the cardiorespiratory "cripples," and those who were suitable for surgery. The correlation of vital capacity, maximal breathing capacity, functional residual air, and residual volume, in relation to the total lung capacity of the 3 classes of patients, was statistically significant.

The mean pulmonary artery pressure for the entire series of patients was between 18 and 19 millimeters of mercury. The mean pressure of the patients who died was 22 millimeters of mercury. While working without occlusion of the pulmonary artery, the pressure rose 50 per cent over the resting value. During occlusion of the artery without work, the pressure again rose 50 per cent over the resting value. Therefore, it was predicted and found to be true that working with occlusion of the pulmonary artery caused 100 per cent increase in pressure. There was good correlation between the various phases of the tests, so it was of no moment if a patient was unable to perform any part of the test.

There was no significant correlation between the spirometric readings and the pulmonary arterial pressures, so it must be concluded that the prognostic value of spirometry must be correlated with some value other than pulmonary hypertension.

The authors emphasize that this method is arduous and time-consuming, and that, since it requires expensive apparatus and a degree of skill on the part of the operator and assistants, it cannot always be done in conjunction with thoracic surgery.

—*John J. Bergan, M.D.*

Problems Concerning Closure of the Bronchial Stump in Lung Resections (Probleme des Bronchusstumpfverschlusses bei Lungenresektionen). R. H. Jenny. *Thoraxchirurgie*, 1956, 4: 214.

Since Rienhoff has introduced dissection and separate ligation of the different pulmonary arterial vessels and pertinent bronchi in lung resections, the technique and the suture material employed have been altered and improved considerably without one of the methods being entirely satisfactory. From the literature, the average occurrence of postoperative bronchopleural fistulas appears to be at least 5 to 15 per cent.

The author reviews 251 lung resections of his own and 349 resections carried out by different surgeons at the Second Surgical University Clinic, Vienna. The main causative factors for the development of postoperative fistulas are: (1) insufficient closure of the bronchial stump, (2) avascular necrosis, and (3) septic necrosis.

In the effort to employ as little suture material as possible, interrupted sutures may be placed too far apart, and also an insufficient amount of bronchial tissue is grasped with the single stitches, so that the suture line appears to be tight to controlled respiration, but does not resist increased intrabronchial pressure exerted by coughing. The effect exerted by pressure increases with the increase in diameter of the lumen. According to roentgen stereoscopic examinations by Brueckner, the diameter of the right main bronchus as an average is 17 millimeters, and the diameter of the left main bronchus is 13 millimeters. This explains the fact that more fistulas occur after pneumonectomies of the right lung than of the left. In the author's series, the incidence was 4 to 3.

The author cannot agree with the opinion, that the suture material employed would be unimportant. After 96 pneumonectomies for bronchial carcinoma, 7 fistulas occurred within 6 weeks post operatively. Another 2 fistulas that occurred 2 and 4 months after operation respectively could not be attributed to closure of the bronchial stump. In both instances transsection of the bronchus was carried through grossly healthy tissue, which microscopically proved to be invaded by tumor cells. In 55 of the 96 patients, stainless steel wire was employed for closure of the bronchial stump; 3 bronchopleural fistulas occurred in this group, and 4 fistulas followed 39 pneumonectomies in which perlon or nylon was used as suture material. More fistulas occurred after resections for central carcinomas than after resection for peripheral carcinomas (7 to 2). This is explained by the fact that hilar lymph node metastases are rarely found at operation in the cases of peripheral carcinomas; even less is tumor growth seen in the main bronchus.

In order to avoid aseptic necrosis, the proximal stump of the bronchus should not be clamped before transsection is carried out. No mattress sutures should be used. The bronchial artery should be ligated at the level of transsection but not proximal to it. The advantage of a pleural or pericardial flap that covers the suture line is not entirely clear. The author has performed 16 pneumonectomies and 12 lobectomies employing an interrupted suture of steel wire following the Overholt procedure. In none of the cases did leakage occur. The Overholt procedure requires very little suture material, thus preventing aseptic necrosis. A pleural or pericardial flap may prevent stitch abscesses from opening into the pleural cavity. Preoperative preparation of the patient with streptomycin is strongly indicated. Gordon found postoperative fistulas occurred in 6 per cent of the patients, when

streptomycin treatment was employed over a period of 3 weeks preoperatively; if the treatment was less than 3 weeks, the incidence of postoperative fistulas was 16 per cent; without antibiotic treatment, fistulas occurred in 50 per cent. If streptomycin premedication is extended over too long a period, resistance of the bacilli develops, and accordingly the incidence of bronchopleural fistulas increases in those patients.

The author has had favorable experiences by causing a corrosion of the bronchial mucous membranes with silver nitrate before the bronchus is closed. Following such corrosion, it was found that firm granulations were rapidly covered with intact epithelium in animal experiments. The method has been employed successfully in 25 lung resections and in 2 resections of the trachea; only 1 fistula occurred in this group.

Twelve pneumonectomies, 38 lobectomies, and 10 segmental resections have been performed for benign lesions. In 18 patients steel wire was employed for closure of the bronchial stump. No fistula occurred in this group, but 2 fistulas followed 32 resections in which perlon or nylon was used as suture material. Wire has not been used for segmental resections, since hemorrhage that resulted from erosion of lung tissue or blood vessels has been described in the literature. No fistulas developed after segmental resections.

Fourteen pneumonectomies, 26 lobectomies, and 6 segmental resections were performed for tuberculous lesions. In 13 patients steel wire was employed. There were no fistulas in this group, but 6 fistulas occurred after 27 resections in which perlon or nylon was employed. —*Erwin Simandl, M.D.*

On Bronchopleural Fistulas, Occurring After Lung Resection (Ueber Bronchialfisteln nach Lungenresektion). Olivier Monod and Brigitte Weyl. *Thoraxchirurgie*, 1956, 4: 197.

Comparatively little attention is being paid in the literature to the occurrence of bronchopleural fistulas after lung resections. Yet it still represents a serious problem in modern lung surgery.

As opposed to parenchymatous fistulas of the lung, which most frequently occur after segmental resections and usually close spontaneously within a short period of time, true bronchopleural fistulas represent a communication between the intrabronchial lumen and the pleural space, not infrequently associated with an external opening through the chest wall.

Bronchopleural fistulas occur either in the immediate postoperative period (within the first 2 weeks), in the early postoperative period (until the third month), or after the third month. The authors did not encounter fistulas that appeared after the fourth month. It has been said, that fistulas which develop immediately after operation result from technical errors, and that those occurring later are due to the patient's disease. The authors do not agree with this opinion, since the same surgeons employ the same technique in any case, and these days most fistulas follow operations for tuberculous lesions.

The authors have evaluated 406 cases of lung resections. The overall incidence of postoperative fistulas was 24 (5.9 per cent); 7 of the fistulas occurred after 90 pneumonectomies, 9 after 175 lobectomies, and 8 after 141 segmental resections. Two of the fistulas followed resections for malignant lesions, and 22 occurred after surgery for tuberculosis. It therefore appears that the underlying disease is the most important factor for development of postoperative bronchopleural fistulas.

In tuberculosis the incidence of leakage of the bronchial stump appears to be related to the following:

1. *The nature and extent of the lesion.* Bilateral bacillary tuberculosis is more apt to lead to postoperative fistulas than a single tuberculous focus. In the author's series 12 patients had bilateral lesions, and 4 of these had bilateral pneumothorax. The sputum tests were positive in all of the 22 cases.

2. *Involvement of the bronchi* in 14 of 18 patients, who were subjected to pertinent preoperative study showed irritation and inflammation of the bronchial mucus membranes (13 cases) at bronchoscopy. In 4 of these patients, reactive bronchial stenosis was found; in 5 tuberculous bronchiectasis was demonstrated. Radiologically visible bronchitis seems to be significant.

3. *Involvement of the pleura.* It was found in all but 1 patient. Four patients were known to have a history of pleurisy, 6 had a seropneumothorax, and 2 a pyopneumothorax without perforation and 6 with perforation. In most instances extensive pleural adhesions were encountered at operation.

4. *Involvement of the hilar lymph nodes and vessels.* In these instances masses of tuberculous material are attached to the area of the suture line closing the bronchial stump.

5. *Resistance of the bacilli against streptomycin.* In 11 of the 22 patients, resistance against streptomycin was determined. It was found to be present in only 6 instances, but in vitro determination does not seem to be entirely conclusive, since the ineffectiveness of streptomycin was evident clinically in the remaining cases. This is in accordance with Brunner's report concerning surgery for nonspecific bronchiectases. The incidence of postoperative fistulas was 50 per cent before penicillin was known, but it was only 2.6 per cent when penicillin was employed.

6. *The role the general condition* plays in the course of tuberculosis is well known enough. Most postoperative fistulas occur in the poor risk patients.

Postoperative bronchial fistulas are bronchogenic or pleurogenic in origin. Most of the fistulas occur after infection of pleural effusions. The effusion, therefore, should primarily be prevented. The authors conclude that postoperative bronchopleural fistulas result from the contact of the suture line closing the bronchial stump with infectious material that is resistant to antibiotic treatment, and in the presence of pathologic changes of the bronchial wall.

Conservative treatment is rarely successful and should be employed only if definite contraindications to the operation, or to the preparation of the patient for surgery are present. All surgical procedures are sanguinary, extended, and technically difficult. Fistulas after lobectomies and segmental resections not infrequently are situated at a distance from the suture line. Fistulas of the bronchus of the upper lobe can be successfully treated within a period of 10 days postoperatively by means of negative pressure drainage. For fistulas that occur at a later date débridement and resuture of the bronchial stump are necessary. After

lobectomies of the lower lobe fistulas may close spontaneously if the diaphragm is immobilized, which, however, diminishes the functional lung parenchyma.

As surgical treatment for fistulas of the main bronchi is not satisfactory, the authors have devised a procedure which they call "Radical cure." Fistulas of the left main bronchus, situated behind the aorta, are approached by mobilization of the aorta after ligation and division of a few pairs of intercostal arteries. The bronchial stump is then débrided, resutured, and covered by a muscle graft. An extended thoracoplasty is performed in addition. Negative pressure drainage is employed in the postoperative period. The procedure has been employed in 4 cases; it was successful in 3 of the cases. One patient died of necrosis of the aortic wall 3 weeks after operation.

To avoid postoperative complications, such as bronchopleural fistulas, patients should be brought to surgery before their general condition has deteriorated and resistance of the bacilli against streptomycin has developed. Therefore, co-operation of the surgeons and internists is highly important. At operation, only the peripheral cut end of the bronchus should be clamped, transsection should be carried out through healthy bronchial tissue, and stainless steel wire employed as interrupted suture. The bronchial stump should be covered with pleura, pericardium, or muscle. Thoracoplasty should be more frequently employed in order to adjust the thoracic cavity to the expandibility of the remaining lung tissue. After partial resections the remaining lung tissue should be brought in contact with the thoracic wall within 2 hours postoperatively and maintained in position until adherence takes place (48 hours). This is achieved by means of negative pressure drainage which employs 2 chest tubes; one of the tubes drains air from the upper part of the pleural cavity, the second drains the reactive pleural effusion.

Both of the bronchial fistulas following resection for malignant lesion occurred in the second postoperative month. They were closed successfully by means of corrosion with silver nitrate at bronchoscopy and negative pressure drainage of the empyema. One of the patients died of metastases 1 year after closure of the fistula. At autopsy a bronchial carcinosis was found. The other patient had an advanced tumor which at the time of operation showed wide communication with the bronchial tree. Extended pleural adhesions were also found.

The authors believe that the nature and extent of the underlying disease were responsible for the development of the fistulas. —*Erwin Simandl, M.D.*

HEART AND PERICARDIUM

The Use of "Arterialized Venous" Blood from a Reservoir for Short Periods of Open Heart Surgery in Preference to Hypothermia. Viking Olov Björk. *Acta. chir. scand.*, 1956, 111: 285.

In many cases of cardiac surgery in which open repair is preferable to a closed method, perfusion of the patient with arterialized (oxygenated) blood is believed superior to hypothermia. At present the main indications for hypothermia are certain atrial septal defects which are localized low down anteriorly, are close to the valvular plane in children, are very large in adult patients, or have the fused valvular dome as in cases of isolated pulmonary valvular stenosis.

The method of repair used in 2 of the cases is described in detail. In both operations arterialized venous blood from a reservoir was used in preference to hypothermia. For long operations, particularly in adults, a heart-lung machine is essential; but for short operations in small children, Warden's method is satisfactory. While the donor breathes 100 per cent oxygen the arm is warmed in a water bath at 45 to 47 degrees C. for 15 minutes. Blood is collected from the antecubital vein in 500 cubic centimeter siliconized bottles containing 20 milligrams of heparin and 50 cubic centimeters of glucose solution. The blood is drawn on the morning of operation to minimize the storage time and the consequent loss of platelets. The arterialized blood is placed in a reservoir and pumped via a sigmamotor through a cannula in the subclavian artery and then into the aorta at operation. A corresponding volume of venous blood is removed from the cannulated superior and inferior vena cavae.

An open closure of a 2.5 centimeter septal defect 0.5 centimeter above the atrial ventricular plane in an 8 year old girl weighing 29 kilograms is described. After bilateral subcostal incision and transection of the sternum, the right subclavian artery was cannulated and plastic cannulae were introduced into the superior vena cava through the azygos vein and into the inferior vena cava through the right auricular appendage. Heavy line threads which encircled the 2 vena cavae were drawn taut around the cannula and produced an inflow occlusion. Both the aorta and the pulmonary artery were clamped and perfusion was started. Eighteen hundred cubic centimeters of arterialized blood were pumped into the aorta, and 1,500 cubic centimeters were removed from the 2 vena cavae in 4 minutes. The Satinsky clamp was removed from the atrial wall and the defect was closed by interrupted No. 00 Ethicon silk sutures. When the inflow and outflow occlusion was discontinued and the perfusion stopped, the heart immediately took over the circulation. The incision in the subclavian artery was closed. Protamine sulfate was given at the end of the operation.

In a second case, a 13 year old boy with an isolated pulmonary valvular stenosis, the valvular dome was grasped under direct vision and divided by scissors out to the arterial wall at two opposite places. The flaccid dome was located 2 centimeters centrally to where it was palpated before the pulmonary artery was opened. The opening admitted 2 fingers, and no infundibular stenosis was palpated. Inflow occlusion lasted for 1 minute and 57 seconds, and 300 cubic centimeters of arterialized blood were administered. Again the heart took over the circulation immediately after release of the occluding clamps. Both patients did well postoperatively. —*Allan D. Callow, M.D.*

Causes of Death in 1,000 Operations for Congenital Heart Disease. Willis J. Potts, William O. McQuiston, and Thomas G. Baffes. *Arch. Surg.*, 1956, 73: 508.

Following 1,000 operations for congenital heart disease, there were 90 deaths and 89 postmortem ex-

aminations. There were 72 deaths among 550 children with cyanotic heart disease, and 44 of these 72 fatalities occurred in patients whose cyanosis was remediable by more or less accepted surgical procedures. Cerebral hemorrhage or cerebral thrombosis was the obvious cause of death in 7 patients and the likeliest cause in 2. Seven children died of heart failure postoperatively, and the outstanding finding at autopsy examination was bloody congestion of the lungs. Blood loss and shock caused 6 deaths, and the authors believe 3 of these deaths were preventable. Pneumonia and purulent tracheobronchitis were the causes of death in 7 children, and it is difficult to know whether these infections were secondary to, or aggravated by, intubation. Postoperative infections caused 3 deaths. Occlusion of a patent ductus arteriosus resulted in 5 deaths during aorticopulmonary anastomosis in patients with pulmonary atresia. Too large an aorticopulmonary anastomosis accounted for 3 deaths, and the remaining 4 deaths in this group of 44 fatalities were due to various causes. There were 15 deaths in 36 children in whom no definitive palliative or curative operative procedure could be performed at the time of exploratory thoracotomy. Of 15 patients with transposition of the great vessels 13 died postoperatively.

There was no mortality after 347 operations for patent ductus arteriosus. Two deaths occurred in a group of 52 patients undergoing operative correction of coarctation of the aorta. Twenty-five patients with anomalies of the aortic arch were subjected to surgery, and 6 of these children died. Four of these deaths were probably due to technical errors and a poor choice of endotracheal tubes by the anesthesiologist. One of 5 patients with an interatrial septal defect succumbed following a closed method of suture of the defect.

The authors cited infractions of the basic rules of anesthesia which may have contributed to the operative and hospital mortality in this group of 1,000 patients. However, cardiac arrest was listed as the cause of death only once. It was suggested that the diagnosis of cardiac arrest should be made only in cases of sudden cessation of a normal or near-normal heart, for the term cardiac arrest has been employed too loosely to cover catastrophes in the operating room.

The technique of anesthesia and the choice of anesthetic agents remained the same throughout the series, i.e., cyclopropane anesthesia administered by the to-and-fro absorption technique with controlled respiration. —*Gilbert S. Campbell, M.D.*

The Influence of Ligation of the Internal Mammary Artery in Myocardial Insufficiency (Influenze della legatura delle arterie mammarie interne sulla insufficienza miocardica). G. DeMarchi, M. Battezzati, and A. Tagliaferro. *Minerva med.*, Tor., 1956, 2: 1184.

The authors present 18 cases of myocardial insufficiency in which the internal mammary artery had been ligated in the second interspace and anastomosed to the coronary circulation. The results were gratifying clinically and the electrocardiogram and BCG tracings returned to normal or near-normal.

Cases of myocardial insufficiency due to a decreased blood supply in the presence of coronary arteries with adequate lumens are most favorable to this type of treatment. Diseased coronary arteries with atherosclerosis and thrombosis cannot be made to carry a much increased circulation simply by increasing the volume of blood.

—*Warner F. Bowers, M.D.*

A Critical Review of Old and New Problems in Coarctation of the Aorta (Revisione critica di vecchi e nuovi problemi, dottrinali e clinici, in tema di coartazione aortica). L. Provenzale and G. F. Della Penna. *Policlinico, sez. chir.*, 1956, 63: 274.

Forty cases of aortic coarctation were critically reviewed. The authors classified the coarctations according to Botalian, preisthmian, isthmian, sub-Botalian, and subintercostal coarctations. Botalian coarctations, the most important, are further classified (merely surgical criteria) as sudden coarctations (sand glass-shaped, excentric, without poststenotic dilatation), gradual or diffuse coarctations (typical, without poststenotic dilatation), and mixed coarctations (first and second types). Each variety gives rise to particular surgical problems.

Stress is laid on the hemodynamic differences existing between isthmial and sudden coarctations, and on the analysis of the genesis of the suprastrictural high blood pressure, which in the authors' opinion as well as in the light of research is probably induced by mechanical factors. The clinical picture does not usually give rise to doubts, and the diagnosis is generally made without any particular difficulty.

The use of vascular grafts, which permits even patients in advanced age to undergo operation, has led to a revision of the criteria for establishing operative indications.

The fundamental points to be borne in mind in the rational treatment of aortic coarctation may be summed up as follows: (1) the anastomosis should be as wide as the vessel lumen, (2) the vascular axis should be conserved, and (3) the collateral circulation should not be disturbed.

—*Mariano Lopez Belio, M.D.*

Problems in the Surgical Management of Acute Dissecting Aneurysm of the Aorta. W. Dean Warren, Julian Beckwith, and William H. Muller, Jr. *Ann. Surg.*, 1956, 144: 530.

Although dissecting aneurysm of the aorta has been recognized as a distinct entity for more than 150 years, the authors report that the first account of the surgical treatment of this condition did not appear until 1935. Since that time, however, many reports dealing with the surgical management of dissecting aneurysm have appeared in the world's literature with varying results from this heroic treatment.

The authors describe the treatment of 5 cases. In one case the usual fatal termination was averted and except for a sustained hypertension the 56 year old woman has been in good condition since the operation.

The mortality rate in untreated cases of dissecting aneurysm of the aorta has been estimated to be between 75 and 90 per cent. The feasibility of surgical intervention has been suggested by the so-called healed dissection of the aorta as found at autopsy from unrelated causes of death. The great majority of these

cases are found to have ruptured back into the true lumen of the aorta distally and thereby formed a re-entry site for the aneurysmal channel. Although it is realized that a small percentage of the cases with spontaneous formation of a distal internal opening have had a subsequent external rupture, it would seem worthwhile to attempt to salvage even a small percentage of these stricken subjects.

The differential diagnosis of dissecting aneurysm of the aorta most commonly must be made from either myocardial infarction or an intra-abdominal emergency. The pain of dissecting aneurysm is usually very severe and often described as a tearing sensation. In any patient with pain in the chest or back, of such severity that narcotics fail to relieve it, the diagnosis of dissecting aneurysm should be considered. Usually of great significance is the location of the original pain and the changes in position which may follow. Although it may mimic exactly a myocardial infarction with radiation of the pain to the neck and shoulders, it more commonly radiates through to the back between the scapulae. Should the pain shortly move into the lower thoracic and lumbar areas of the back with radiation to the hips or the legs, a diagnosis of dissecting aneurysm is greatly strengthened. The pain of myocardial infarction may involve the intrascapular or lower thoracic areas, but once its pattern is established, it tends to remain constant.

In the physical examination there are several features which, if present, should make one suspicious of a dissecting aneurysm. An aortic diastolic murmur is frequently found, and should there be indication that it is of recent occurrence, it offers strong support to the diagnosis. The difference in peripheral pulses has long been recognized as one of the salient clincial features and in one of the reported cases provided the real clue to the diagnosis. Secondary neurologicial disorders such as hemiplegia or paraplegia, which may be either permanent or transient, may appear. It should be emphasized that such findings in an illness beginning with severe pain should bring to mind an acute dissecting aneurysm. Finally, an important characteristic of the disease is hemorrhage into the pericardial or pleural spaces. The discovery of a bloody effusion in either of these spaces, accompanied by other features of the disease, is very strong evidence favoring the diagnosis.

Laboratory aids are of occasional value, with the finding of blood in the urine and elevated blood urea being the most useful. Roentgenologic examination of the chest may be of considerable help in the acute as well as the chronic cases. The widening of the aortic shadow or the presence of intrapericardial or intrapleural fluid may frequently be detected in this manner. During the later course of the disease an angiocardiogram may be performed safely, and in most instances this should establish the diagnosis. The electrocardiogram may follow a variety of patterns, but is mainly of value when it is normal. It is unusual to find a repeatedly normal electrocardiogram in a patient with a myocardial infarction large enough to produce severe pain and peripheral vascular collapse.

Once the diagnosis has been established, the question of the proper time for surgical intervention arises. From the study of autopsy data it is an inescapable

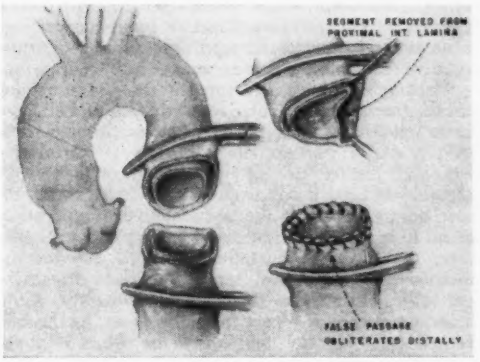


FIG. 1 (Warren *et al.*). Drawing of the operation to portray the basic steps in the procedure. (Courtesy of J. B. Lippincott Co.)

fact that the most critical period in the disease is the first 48 hours. It is in this period, therefore, that one would expect the greatest salvage of cases to occur, but, on the other hand, there is little doubt that this is the most dangerous period in which to operate and one in which the surgical mortality will be much higher than in the more chronic cases.

It is generally believed that the operative approach should be through the chest, as in one series of cases 95 per cent of the acute dissections began in the thoracic aorta, while the distal limit reached the abdomen in only 35 per cent of this same large series. Furthermore, although from 85 to 95 per cent of these patients died from hemorrhage, only 2 per cent of the dissections occurred in the abdomen. Four general aims must be kept in mind regardless of the type of operation that is performed. These are the prevention of distal extension of the aneurysm, creation of a distal re-entry site for the sac, prevention or relief of arterial obstruction, and control of hemorrhage from the aneurysm.

The basic steps of the procedure used in one of the reported cases in this article are shown in Figure 1. This is, in essence, a closure of the false passageway by a circumferential suture at the distal stump of the aorta, whereas the proximal aorta is left with the dissected intima lying free as a re-entry site for the circulating blood that passes under it. A very similar procedure, and one that accomplishes the same purpose, can be done without completely transecting the vessel and merely with a partial arteriotomy incision.

A very detailed discussion of measures aimed at controlling the hypertension attending the application of a clamp across the aorta, and again the hypotension following the removal of the clamp, are given in this article. The use of vigorous vasopressors and vasodepressing drugs has been found to be an important part of treatment. —*Matthew H. Evoy, M.D.*

Aortic Subvalvular Stenosis; a Report of 5 Cases Diagnosed During Life. RUSSELL BROCK and P. R. FLEMING. *Guy's Hosp. Rep.*, Lond., 1956, 105: 391.

THE COMPLETE case histories of 5 patients with aortic subvalvular stenosis are presented. Graphic illustration

of the withdrawal pressures in the left heart appear in the article. The difficulty of specific preoperative diagnosis is accentuated, and attention is directed to the relative frequency of this anomaly.

Various men have attempted to set up criteria for the diagnosis of subvalvular aortic stenosis, but all have been proved at times to be in error. Angiocardiography may reveal the site of narrowing. Catheterization of the left side of the heart through the left atrium has been unsuccessful. Transventricular pressure studies through the aortic valve at operation failed to reveal the stenotic site in one patient. Therefore, the authors conclude that the only certain method of making the correct diagnosis is by direct visualization of the area. In most cases, however, withdrawal pressure readings from the aorta to the left ventricle at operation will reveal the site of stenosis.

The first case was of a 9 year old boy in whom withdrawal pressures suggested subvalvular stenosis, and who was successfully treated by punch resection. The second patient was also treated successfully with punch resection. Withdrawal pressures in the third patient indicated a valvular stenosis, but on opening the aorta, a relatively normal aortic valve was seen. By palpation a subvalvular stenosis was found and dilated with the finger, and a satisfactory result was recorded. The fourth patient had an inoperable subvalvular stenosis; the fifth patient also died of cerebral edema after a satisfactory treatment of the subvalvular narrowing.

The authors hesitate to recommend blind infundibular punch resection as a technique generally applicable to subvalvular aortic stenosis, and they mention several perils inherent in its use. They suggest that an alternate method of extending an aortic incision down through the valve commissure be used to open the subvalvular region. Another approach could be a direct incision into the infundibular region. All these approaches have definite drawbacks. The authors believe that the lesion discussed is curable, but that a more refined technique is needed.

—*Richard L. Lawton, M.D.*

Aortic Valvulotomy Under Direct Vision During Hypothermia. F. JOHN LEWIS, NORMAN E. SHUMWAY, SUAD A. NIAZI, and ROBERT B. BENJAMIN. *J. Thorac. Surg.*, 1956, 32: 481.

AORTIC VALVULOTOMY performed by a closed technique is usually unsatisfactory because the aortic valves are often found to be irreparably damaged. A direct surgical approach to the aortic valve requires a special method to obviate air embolism. Experimentally, it has been shown that small amounts of air could be tolerated in the left heart and aorta, provided resuscitative measures are applied promptly. Air embolism could be prevented by washing out the left heart before aortic closure. Operation should be done under hypothermia, endotracheal intubation, and thiopental muscle relaxant anesthesia, through an automatic respirator. Surgery is begun when the body temperature falls to between 28 and 31 degrees C. The cardiac outflow and inflow must be controlled by clamps and tapes even before the aorta is opened. The aortotomy incision is made along the left border of the aorta which is held by the Beck clamp. Blood is evacuated by suction as the valves are exposed. Each commissure is opened out to the aortic wall, but calcium is not removed from the cusps. This is followed by evaporation of the left ventricle and aorta with saline solution, after which the pumping action of the heart evacuates air and fluid through the aortic incision. This is then closed and the patient is rewarmed. This operation was performed on 3 human subjects. —*B. G. P. Shafiroff, M.D.*

Five Year Postoperative Results of First 500 Patients with Blalock-Taussig Anastomosis for Pulmonary Stenosis or Atresia. B. DANIEL WHITE, DAN G. MCNAMARA, S. RICHARD BAUERSFIELD, and HELEN B. TAUSSIG. *Circulation*, 1956, 14: 512.

THIS REPORT is essentially an analysis of 244 patients who were originally benefited by a Blalock-Taussig anastomosis and whose status 5 years or more following the operation is known. Among the remaining 256 of the total group of 500 cases, there were 81 deaths at or within 6 months of operation, 30 exploratory thoracotomies only, 67 were lost to follow-up, 11 survivors after surgery but without improvement, and uncompleted 5 year follow-up examinations in 67 cases.

The results in the 244 cases are classified as good or fair. A good result indicated an almost normal exercise tolerance and nearly normal values for the red blood count, hemoglobin, and hematocrit. The patients with fair results gained some improvement from the operation but continued to have polycythemia and significant limitation of exercise. Of the 244 patients studied 226 (93 per cent) had a good result and 18 (7 per cent) a fair result originally. Five to 8 years after operation, 163 (67 per cent) of the 244 have maintained their improved status. Among the 226 with an initial good result, 72 per cent have maintained their improvement; however, in 16 the results are now classified as fair, in 9 as no longer improved, and 23 patients required and survived a second operation; 33 have died. Two of the 18 with a fair immediate result are still in the same status, 6 have survived a second operation, in 2 the condition is no longer improved, and 8 have died.

The long term results have been far better for the patients with the tetralogy of Fallot than for those with other malformations. Sixty-nine per cent of the 212 patients with the tetralogy of Fallot have maintained a good result and 11 per cent have died. Only 50 per cent of the 32 patients with other malformations had a good result, and 31 per cent have died.

The results were further studied by evaluating changes in the size of the heart, the hemogram, and the arterial oxygen saturation in the 163 patients with good long-term results. By all of these criteria 126 results were excellent. Considerable cardiac enlargement was shown by 23 patients, but without progressive increase in the heart size. In the remaining 14, the hemogram values were considerably elevated (red blood count more than 6.5 million, hemoglobin above 17 gm., and hematocrit more than 55 per cent), but the polycythemia had been stationary in these patients for several years.

It was interesting to find a higher incidence of postoperative cardiac enlargement in the patients with small hearts before operation than in those with cardiac enlargement before operation, the incidences being 57 per cent and 26 per cent, respectively.

Generally speaking, the presence of a continuous murmur indicates that the shunt is open and functioning, while absence of such a murmur is a grave prognostic sign.

The patients maintaining a good result were also analyzed by age groupings at the time of operation. The highest incidence of good results (83 per cent) was obtained in patients between 8 and 12 years of age at the time of surgery.

Subacute bacterial endocarditis was diagnosed in 15 patients (6 per cent) of the 244 originally benefited. Hence, the hazard of this complication is not great and does not appear to be increased by the operation after the immediate postoperative period.

Twenty-five deaths have occurred among the 226 patients with an original good result and 8 have occurred in the 18 with only fair initial benefit. The contrasting mortalities of 11 and 44 per cent emphasize the much better prognosis for those who obtain a good immediate result.

—*Thomas E. Boles, Jr., M.D.*

MISCELLANEOUS

The Cardiorespiratory Dynamics of Controlled Respiration in the Open and Closed Chest. ARCHER S. GORDON, CHARLES W. FRYE, and HIRAM T. LANGSTON. *J. Thorac. Surg.*, 1956, 32: 431.

THE NORMAL BREATHING PATTERN in relation to air flow, pressure, and volume was determined by special techniques. The ratio of normal inspiratory to expiratory time varied between 1 to 15 and 1 to 2. The pressure pattern with the closed circuit reservoir was characterized by a curve which showed a short inspiratory plateau followed by an expiratory fall, with a plateau twice as long as that for inspiration. The volume curve is similar to the latter with modifications due to inertia and resistance. A positive airway pressure during inspiration decreased the cardiac output from the right heart.

In the closed chest patient, good results for the blood pressure, p-carbon dioxide, and oxygen saturation were obtained by positive negative pressure (PNP) breathing technique. In the open chest patient, intermittent positive pressure provided good physiologic effects during the period of controlled respiration. The negative pressure phase in the open chest cases did not serve to elevate the blood pressure significantly and decreased the elimination of carbon dioxide.

A cycling rate at 12 times per minute permitted normal oxygenation but at a slower rate resulted in ventilatory insufficiency. The use of automatic controlled respiration usually prevented respiratory acidosis. Passive hyperventilation alkalosis did not seem to be harmful, particularly if limited in duration. Pulmonary ventilation under +15 to +20 cm. of water, and —5 cm. of water caused minimal lung damage. Negative pressures up to —22 mm. of mercury were followed by collapse of the terminal bronchioles and entrapment of air in the alveoli.

A negative expiratory phase was of value in emphysematous lungs, in cases with expiratory resistance, and when the cycling rate was too rapid. Carbon dioxide could be flushed out by alveolar ventilation but could not be removed by suction from negative pressure deflation. Intermittent positive pressure (IPP) breathing during thoracotomy permits near normal oxygen saturation with the elimination of carbon dioxide. —*B. G. P. Shafiroff, M.D.*

Pneumoperitoneum in the Management of Esophageal Hiatus Hernia; a New Diagnostic and Therapeutic Procedure. BERNARD MAISEL, WILLIAM COOPER, and FRANK GLENN. *J. Am. M. Women Ass.*, 1956, 11: 299.

THE USE of pneumoperitoneum as a treatment in poor risk patients, refractory to usual conservative measures, is described.

The types of hiatal hernia are discussed. True congenital short esophagus is rare, accounting for 1 per cent of all hernias. Paraesophageal hernias comprised from 20 to 25 per cent, whereas 70 per cent were of the sliding type. A combination of sliding and paraesophageal hernia occurred in 5 per cent of the total number.

Pathologic alterations include ulceration, bleeding, and, finally, cicatrization. Blood loss is usually slow and results in anemia, hypoproteinemia, and cachexia. Scarring produces stenosis and shortening of the involved area.

Etiologic factors are discussed. The most likely origin stems from a loss of the normal vis-a-tergo of the tissues with aging. Changes in the intrathoracic pressure, associated with coughing, sneezing, and defecation, provide the necessary stress to produce hiatal hernia as the individual grows older. Obesity, as well as a vagovagal reflex component, may play a part in the development of the disease.

Diagnosis is usually established by x-ray examination of the upper gastrointestinal tract. Differentiation must be made between the symptoms due to hiatal hernia, peptic ulcer disease, chronic cholecystitis, angina, and gastrointestinal cancer.

Medical management involves the institution of dietary and therapeutic regimens similar to those used in the treatment of peptic ulcer disease. Elevation of the head of the patient's bed from 6 to 8 inches is often beneficial.

Surgical treatment is indicated for intractable symptoms, bleeding, persistent ulceration, and perforation. Because of the age group involved there are often major cardiovascular, pulmonary, or renal contraindications to the surgical approach.

One of the authors (B.M.) studied the effect of pneumoperitoneum in large groups of patients undergoing treatment for tuberculosis. The production of visceroptosis as a result of this procedure suggested a beneficial effect in hiatal hernia. Five patients suffering intractable symptoms from hiatal hernia were treated in this manner with gratifying results.

Symptoms including epigastric distress, rumination, precordial pain, nausea, and vomiting were diminished. In one instance, bleeding believed to be from this source was terminated after pneumoperitoneum.

Differentiation between angina and pain due to hiatal hernia may be possible by use of this procedure. Also it serves as a method of distinguishing between dyspepsia resulting from gallbladder disease and hiatal hernia.

The use of pneumoperitoneum may afford the debilitated patient an opportunity to recover sufficiently to permit surgical intervention.

Pneumoperitoneum causes an elevation of the diaphragm. Elevation and stretching tightens the esophageal crus and produces a sphincterlike effect. Phrenic nerve crush, while causing an elevation of the diaphragm, does not effect a tightening of the crus, and the associated paradoxical motion decreases pulmonary function. Pneumoperitoneum actually enhances ventilatory efficiency because it reduces the residual air capacity of the lungs.

The technique of pneumoperitoneum is presented. The initial injection of 1,000 c.c. of air should be done in the hospital so that the pain produced by diaphragmatic irritation can be adequately controlled. Thereafter, refills can be done on an outpatient basis with safety. —*M. C. Anderson, M.D.*

Hernia of the Liver Through the Diaphragm (L'ernia diaframmatica del fegato). MARIO BORRI. *Policlinico, sez. prat.*, 1956, 63: 1189.

TO A PERSONAL CASE of hernia of the liver through the diaphragm the author adds a review of published cases which now number 34. He points out that herniation, with or without partial eventration of the right dome of the diaphragm, may take place and that distinction between the two types may be very difficult. The presence of an anomalous lobe of the liver pressing on the diaphragm may be a differentiating point.

However, he points out that partial eventration of the diaphragm with herniation and an anomalous lobe with herniation may actually be different expressions of the same process, as well as actual herniation of the liver itself.

The repair is a surgical problem in the presence of either symptoms or an undiagnosed mass in the chest. —*Roger H. L. Wilson, M.D.*

Contribution to the Technique of the Conservative Incision of the Diaphragm in Abdominothoracic Operations (Beitrag zur Technik der schonenden Zwerchfellincision bei abdomino-thorakalen Operationen). Z. ŠERÝ, J. KRÁLÍK, D. HIKLOVÁ, and J. MALINSKÁ. *Thoraxchirurgie*, 1956, 4: 125.

A SIGNIFICANT COMPONENT of the abdominothoracic approach is the division of the left half of the diaphragm extending to the esophageal hiatus. This type of incision has rendered possible not only resection, but also reconstruction after radical operation for cancer of the cardia and stomach. It is indispensable in operations for neoplasms of the lower esophagus and also constitutes a valuable adjunct in the performance of splenorenal anastomoses and of difficult splenectomies.

The left abdominothoracic approach however, has, also certain disadvantages. Not more than 10 centimeters of the lower esophagus can be exposed and not more than 5 centimeters of the esophagus can be removed if sufficient tissue is to be reserved for anastomosis. In many carcinomas of the cardia this will not suffice. In addition, a total immobility of the left diaphragm with its well known sequelae results. It would seem preferable to avoid a division of the muscular branches of the left diaphragmatic nerve in order to prevent a transitory or permanent denervation of the left half of the diaphragm.

The authors present a detailed anatomic study of the muscular branches of the left diaphragmatic nerve, including the site of its insertion into the diaphragm, the type of primary (extramuscular) ramification in its supradiaphragmatic course, and the course and topical relations of the left diaphragmatic nerve in various parts of the diaphragm. They conclude that these anatomic findings have bearing on the surgical technique to be used in the incision of the diaphragm. In spite of variations in the number and appearance of the individual branches of the left diaphragmatic nerve and in spite of individual deviations in course, the distribution of the nerve branches in the various sections of the diaphragm show considerable constancy. This facilitates the orientation of the surgeon during incision of the diaphragm. The illustrated course of the left diaphragmatic nerve indicates that in the usual incision for the abdominothoracic approach through the left half of the diaphragm, extending laterally from the point of insertion of the left diaphragmatic nerve into the esophageal hiatus, most of the muscular branches of the left diaphragmatic nerve, including the important posterior branch, are divided. Specimens of muscular branches of the left diaphragmatic nerve reveal that in partial or complete division of the diaphragm into the esophageal hiatus, the incision extending medially from the hilus gap in the left half of the diaphragm causes least damage. With this incision only those branches that serve the ventromedial portion of the diaphragm (pars sternalis and a portion of the pars costalis medial to the hilus gap) are divided.

Since 1952 the authors have used this approach in most of the patients in whom an approach through a left laparophrenothoracotomy was deemed advisable. Following an examination of the abdominal organs through a left oblique transrectal laparotomy, an incision in the intercostal space is extended to provide exposure of the diseased organ. For instance, in a radical, abdominothoracic, subtotal gastrectomy combined with splenectomy, the thoracic portion of the operative incision will be in the ninth or eighth intercostal space. In subcardial, cardial, or esophagocardial localizations of the disease process the thoracic portion of the incision will be made in the eighth, seventh or even more proximal intercostal space. Thus one gains better access to the lower half of the thoracic esophagus. Here also the corresponding cartilage of one or more ribs which are simultaneously and partially resected (approximately 0.5 centimeter) is divided, since this permits better closure of the intercostal space after the intervention.

The division of the musculature of the diaphragm is made at the site of incision in the transverse abdominal muscle where the diaphragmatic musculature adheres to the posterior surface of the costal cartilage. The costal insertions of the diaphragm and those of the transverse abdominal muscle at the level of the seventh, eighth and ninth cartilages are often so close together that the beginning of the diaphragmatic musculature may be difficult to determine exactly. For this reason the first pair of purse-string sutures are inserted into the muscle tissue at a distance of 1

centimeter from each other, and the diaphragmatic musculature is divided between them. By drawing them together at the end of the operation, an accurate reconstruction of the diaphragm becomes possible.

The radial discission of the diaphragm is oriented from the periphery in the direction toward the insertion of the left diaphragmatic nerve into the muscle tissue, and after the insertion of some purse string sutures the intercostal space is spread with a chest retractor. The lobe of the lung is pushed to one side and covered with cloths soaked in physiologic saline. At this phase of the operation it has proved advantageous to separate the folds of the mediastinal pleura from the adjacent fatty tissues in order to visualize more perfectly the dissemination of the emerging nerve branches, as well as their insertion into the hilus gap. This will show whether, in the present position of the patient, there is sufficient distance between the entrance of the nerve branches into the diaphragm and the beginning of the pericardium for the performance of a medial phrenotomy. If there is not, following novocain infiltration the folds of the pericardium are displaced more medially or the body of the patient is inclined to permit a descent of the heart and pericardium to the right. In this manner room is obtained for the performance of the diaphragmatic incision. Another even more important advantage of this medial phrenotomy is the presence of a relatively small number of blood vessels in this area. Only immediately in front of the esophageal hiatus does a larger vessel appear and this is ligated and divided on both sides.

In radial, incomplete diaphragmatic incision for a subtotal gastrectomy or an abdominothoracic splenectomy, it is necessary to expose the left diaphragmatic nerve from the site of its insertion on the pericardium and mediastinum. However, if the esophagocardial portion of the digestive tract or a smaller or greater section of the thoracic esophagus is to be resected with incision of the esophageal hiatus, it is usually necessary to dissect the phrenic nerve from the pericardium and mediastinum, so that they may not obstruct the surgical procedure or be injured. Care must be exercised to avoid injury to the accompanying pericardiophrenic structures. Following the exposure of the phrenic nerve, the two portions of the left diaphragm may be spread apart with the aid of a thoracic retractor, and the phrenic nerve which has been protected from injury with a moist cloth may be pushed to one side.

After intervention the diaphragm is reconstructed with the aid of purse-string sutures. As soon as the effect of the muscle relaxants subsides, a definite twitching in the lateral portion of the left diaphragm may be noted which indicates the maintenance of phasic and tonic innervation of the diaphragm. The very first postoperative roentgenograms will show definite, although somewhat circumscribed, movements of the left diaphragm. In other patients in whom the lateral and posterior branches of the phrenic nerve had been divided the left diaphragm revealed a total paralysis. A few weeks after operation the preoperative mobility is regained, especially in patients who suffered no pleural reaction.

—*Edith Schanche Moore*

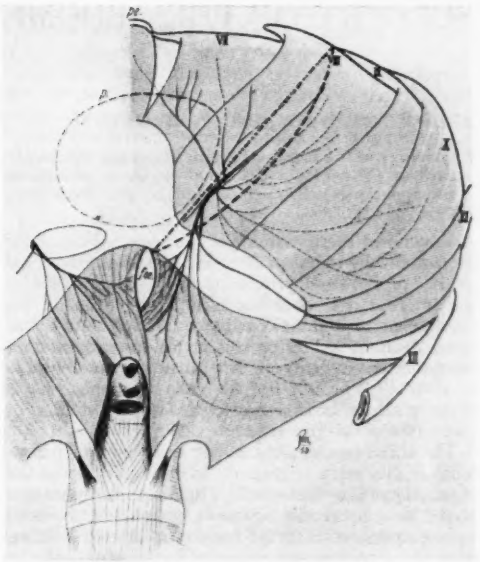


FIG. 1 (Šerý *et al.*). Muscular branches of the left diaphragmatic nerve on the abdominal surface of the diaphragm (from the specimen). *p*, projection of the pericardial insertion. *p.e.*, ensiform process. *f.oe.*, esophageal hiatus; ribs vii–xii of the caudal thoracic aperture—the usual diaphragmatic incision; - . . -. . - . . the most advantageous incision from the anatomical standpoint.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Physiology of the Inguinal Canal; Therapeutic Implications (Physiologie du canal inguinal déductions thérapeutiques). F. LAGROT and N. PY. *Presse med.*, 1956, 64: 1768.

A REVIEW of the dynamics of the inguinal canal led Lagrot and Py (of Algeria) to the hypothesis that congenital or acquired protrusion of a peritoneal sac at the internal ring does not satisfactorily explain the mechanism of inguinal hernias occurring at different ages. Without excluding this factor, the authors believe that the most important cause of iguinal hernia is, in reality, prolapse of the cord, and that logical therapy should be directed toward the prevention or correction of this prolapse.

The three mechanisms of the body by which prolapse is averted are: increase in the obliquity of the inguinal canal by Hesselbach's ligament and plication of the cord upon this ligament, fixation of the cord by the aponeurosis of the transversalis, and holding back of the cord by the action of the internal oblique and transversalis muscles. A defect of one or more of these functions is coexistent with the production of hernia, and restoration of such function is necessary for permanent cure. This physiology explains also the frequency of hernia in infants, its relative paucity in older children and in adolescents, and its recrudescence in the adult.

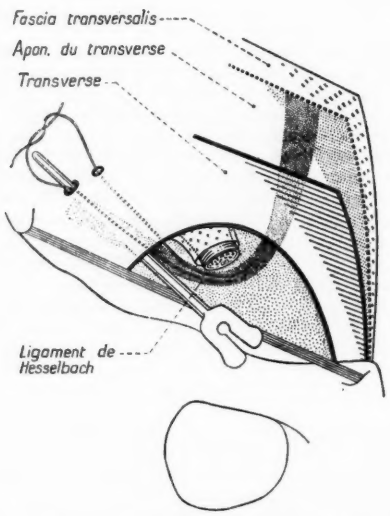


FIG. 1. (Lagrot, Py). Technique: cure of small-neck external oblique hernia by simple suspension of Hesselbach's ligament. The suture is guided by grooved director deep to the inguinal ring in the direction of the anterior superior iliac spine.

The complex operations recently introduced (Cooper ligament repair) are important and indicated for long-standing and complex hernias in the adult. However, in the instance of the simple, small-necked, early inguinal hernia, it is the opinion of the authors that it is more desirable to direct efforts toward the correction of the disturbed physiology than to the anatomy of the canal. Since 1947 they have utilized the technique of suspension of Hesselbach's ligament in the treatment of indirect inguinal hernia not associated with relaxation of the transversalis fascia (FIG. 1). The operation is stated to be simple, adequate, and appropriate for all the muscular elements.

—*Edwin J. Pulaski, M.D.*

Contributions to the Treatment of Acute Generalized Purulent Peritonitis (Contributions au traitement des péritonites purulentes aiguës généralisées). C. MANOLIU FURNICA, N. BUJORICA, I. MAYER, R. PLESU, and M. VANTA. *Acta chir. belg.*, 1956, 55: 525.

THIS article is intended to review the treatment of acute generalized purulent peritonitis up to the present time.

The ability of the peritoneum to protect the abdominal viscera is outlined. The early studies of Recklinghausen, Ranvier, Bizzozero, Golgi, and Dubart are quoted as demonstrating the resorptive ability of the peritoneum, which is so great that about 8 per cent of the body weight can be absorbed within an hour. This is the mechanism whereby the bacterial toxins produce systemic reaction in early peritonitis. The reactive hyperemia, which then develops, provides an opportunity for the leucocytes to help combat the infection. The authors also attribute beneficial properties to the exudate which results. By virtue of its fibrin content, the infectious process may be localized. The role of the omentum in this respect, as well as its being a source of leucocytes and lymphatics, is also mentioned. The treatment of purulent peritonitis has been simple incision and drainage of the peritoneal cavity, and extirpation of the organ acting as the source of infection; however, it is the authors' contention that this therapy may be considered useless and even harmful.

The harmful effects of drainage hinge on the fact that drainage produces a source of mechanical and infectious injury to the peritoneum and greatly prolongs the postoperative period. A technique is described which has been used successfully in the treatment of 43 patients with acute purulent peritonitis. It is based on the intrinsic ability of the peritoneum to combat infection and the need to support the patient's physiological defense mechanisms. Trauma to the peritoneum is kept to a minimum. The patient's general condition is improved by using intravenous fluids, plasma or whole blood transfusions, cardiovascular stimulants, and antibiotics. At surgery, the organ responsible for the peritonitis is identified and removed. Peritoneal toilette is then instituted by complete evacuation of the purulent material followed by gentle lav-

age with warm (40 degrees C.) physiologic saline solution. The lavage is continued until the aspirated solution is perfectly clear. A mixture of 500,000 units of penicillin and 1 gram of streptomycin in 200 to 300 c.c. of saline solution is then placed in the abdominal cavity and in contact with all parts of the abdomen "by stirring." The solution is then aspirated, the wound closed with silk, and the skin closed with clips. Postoperative supportive measures and antibiotics are continued until all signs of peritoneal irritation disappear.

The experience of Soviet surgeons during the war is cited. They showed an 18 per cent reduction in the mortality when drainage was abandoned.

The role of peritoneal toilette is also considered. The authors do not believe that the use of antiseptics, irradiation with ultraviolet rays, or peritoneal perfusion with solutions such as Dakin-Carrel's to be of any value other than the actual mechanical removal of the exudate. —*J. C. Rosenberg, M.D.*

The Effect of the Association of Bacitracin and Neomycin upon Peritonitis (Effetti dell'associazione bacitracina-neomicina nella sindrome peritonitica). G. ANGRISANI. *Gior. ital. chir.*, 1956, 12: 263.

THE AUTHOR reports the results of his experiments with bacitracin and neomycin on 10 dogs. Five dogs each were given 0.5 gram of neomycin and 25,000 units of bacitracin daily for a week. The other 5 dogs were used as controls.

All of the dogs were subjected to a complete section of the colon and an end-to-end anastomosis. A small opening was left at one end to allow for leakage. The preoperative treatment was continued after the operation with some difficulty. All of the control animals died within 48 hours. Of the treated animals 2 died between the third and fifth days. The 3 remaining lived a little longer, 2 dying on the seventh and eighth days. The fifth was still living on the tenth day, when he was sacrificed. At autopsy an abscess was found at the level of the anastomosis. All the other dogs showed diffuse peritonitis.

The author concludes that the combination of neomycin and bacitracin has a beneficial effect upon the subject during the experimental production of peritonitis. He thinks that much more experimentation should be carried out with this combination in animals and in the clinic. The problem of preoperative preparation of the large bowel for surgery is far from having reached an ideal solution.

—*Lucian J. Fronduti, M.D.*

Acute Torsion of the Omentum (Sulla torsione acuta del grande omento). ALBERTO BRODETTI. *Gior. ital. chir.*, 1956, 12: 378.

THE AUTHOR operated upon a 49 year old male with a preoperative diagnosis of acute appendicitis. The diagnosis was not certain, however, and a right pararectal incision was made. When the abdomen was opened the appendix was found to be slightly hyperemic, but it was not considered responsible for the hemorrhagic fluid found in the peritoneal cavity. Further exploration revealed a tumefaction of the great omentum with a violaceous color which represented a torsion of two complete turns from left to right. A resection was performed and the removed specimen was found to weigh about one kilogram. The postoperative course was uneventful and a follow up 2 months later revealed the patient to be in good health.

After discussing the subject and reviewing the literature, the author advances the hypothesis that the torsion of the omentum may have been secondary to infarction of the omentum itself, the infarction being of a hyperergic allergical origin.

—*Lucian J. Fronduti, M.D.*

GASTROINTESTINAL TRACT

Ninety Cases of Acute Hemorrhage of the Digestive Tract (Nonante cas d'hémorragie digestive aiguë). J. GERARD. *Acta gastroenter. belg.*, 1956, 19: 660.

GERARD, Chief Surgeon to the Antwerp Hospital, presents the clinical impressions gained from 90 personally treated patients with acute hemorrhage of the upper intestinal tract.

Twenty-three of the 90 patients had an emergency operation after the transfusion of 800 to 2,500 c.c. of blood. There were 8 deaths (33 per cent), 7 of the 8 occurring in patients more than 55 years of age. The remaining 67 patients had medical or "expectant" treatment, with only 3 deaths, a mortality of 5 per cent. Thirty-eight of these 67 patients underwent surgery after a delay of from 2 weeks to 3 months, with only 3 postoperative deaths, or 8 per cent.

On the basis of these observations, Gerard is of the opinion that bleeding in the upper gastrointestinal tract does not necessarily carry the grave prognosis given it by most workers, nor is its medical management without considerable merit. Some simple rules to follow are these:

1. The patient with severe hemorrhage should not be jostled about, but, rather, should be accorded total physical and psychic rest.
2. Inasmuch as transportation often precipitates or aggravates shock, certain patients are better treated at home than transported to the hospital for care.
3. A certain degree of hypotension is physiologic and overtransfusion may be harmful.
4. When the hemoglobin level falls below 50 per cent, the condition is critical.
5. Small transfusions of about 300 c.c. are preferable to immediate total replacement of the blood lost.
6. A Meulengracht type of diet is instituted as soon as tolerated. —*Edwin J. Pulaski, M.D.*

Experiences with More Than 150 Cases of Acute Upper Gastrointestinal Tract Bleeding (Une expérience de plus de cent cinquants cas d'hemorragie digestive haute aiguë). R. LE CLUYSE and G. BIDON. *Acta gastroenter. belg.*, 1956, 19: 642.

THE POLICY at the Brugmann University Hospital is to study all patients with acute upper gastrointestinal bleeding conjointly by the medical and the surgical resident. The primary goal is to determine without delay the exact etiology of the hemorrhage. One reason for this urgency is that 81 per cent of the patients are more than 50 years old, in poor health, and they frequently require immediate, blood replacement therapy. It is difficult to determine accurately the quantity of blood lost and repeated observation of the patient is probably the best guide for correction of the

deficit. Following blood transfusion the patient is subjected to detailed study, including roentgenography and gastroscopy. A careful history is important in making a differential diagnosis between peptic ulcer, ruptured esophageal varix, hiatal hernia, and drug idiosyncrasy. Except for icteric tint or obvious causes for prolonged drug therapy, physical examination contributes little. Fluoroscopic barium study of the upper gastrointestinal tract is best done no earlier than 48 hours after the last hemorrhage. It is hard on the patient, often contributes little positive information, and now is less routinely practiced than formerly. Gastroscopy is the examination of choice; with its aid the authors have been able to localize the point of hemorrhage in 92 per cent of their 158 cases. They state that in expert hands this examination is neither traumatic nor risky

Age and the severity of hemorrhage are important prognostic factors, especially in the case of bleeding ulcer: for 17 patients under the age of 50, the mortality was 18 per cent, whereas for 73 patients over the age of 50, the mortality was 34 per cent.

Ninety of the 158 patients in the authors' series had bleeding gastroduodenal ulceration, with the lesion in the stomach in 56. The authors endorse surgical intervention for patients with bleeding gastroduodenal ulceration as the only certain means of arresting the hemorrhage and removing the ulcer; however, each case must be evaluated and selected carefully, especially as regards the time for surgery, or the mortality will be unnecessarily high. In relapsing hemorrhage, the greater the delay in getting the patient to surgery, the higher is the mortality. To decrease the loss of time, the criteria established for surgical intervention in ulcer patients include: (1) the patient with the type of hemorrhage ordinarily associated with a grave prognosis (with an estimated blood loss greater than 500 c.c. in a 6 hour period); (2) the patient with serious bleeding who is more than 50 years of age; (3) the patient with suspected or proved gastric ulcer; and (4) the patient with pyloric obstruction as well as bleeding.

Twenty-one patients had bleeding due to gastritis. These were treated by medical regimen, and surgery was reserved for those who failed to respond to medical therapy. Another 21 patients had bleeding secondary to cirrhosis of the liver and 63 per cent of these died. Neither medical nor surgical treatment was outstanding in the treatment of cirrhotics.

The remaining (11) cases are too few in any one category to warrant any discussion. The authors emphasize that skillful resuscitation and anesthesia are basic to good results. —*Edwin J. Pulaski, M.D.*

The Treatment of Acute Hemorrhage of the Upper Gastrointestinal Tract (Le traitement des hemorragies aiguës du segment supérieur du tube digestif). A. L. Froehlich and R. Mathieu. *Acta gastroenter. belg.*, 1956, 19: 655.

The authors (from the Medical Service of the St. Elizabeth Hospital, Antwerp) reviewed their last 100 cases of acute hemorrhage of the upper gastrointestinal tract and concluded the following:

1. The serial erythrocyte count and hemoglobin determinations, all factors considered, are of some help in determining the severity and the cessation or continuance of the bleeding.

2. Since emergency surgical intervention carries with it a high mortality, operation should be deferred until the equilibrium of the patient is restored and, preferably, the origin of the bleeding established.

3. Hemorrhage alone is not the only factor influencing prognosis; the underlying cause and the general condition of the patient are equally important contributors (carcinoma of the stomach, myocardial infarction or other myocardial disease, esophageal varices, and advanced age).

On this basis the authors feel that it is neither necessary to submit all patients with upper gastrointestinal bleeding to emergency radical surgery nor to subject them to exhausting examinations. The age of the patient and the age of the ulcer are the principal determinants of the outcome of an episode of high gastrointestinal bleeding. —*Edwin J. Pulaski, M.D.*

New Thoughts on Diverticula and Ulcers of the Digestive Tract; a Comparative Study of Pathogenesis (Considérations nouvelles sur les diverticules et les ulcères digestifs, étude pathogénique comparative). A. Jung and M. Boudin. *Presse méd.*, 1956, 64: 1658.

Except in the instance of hemorrhage, perforation, or inflammation, diverticula of the digestive tract per se seldom attract the attention of the clinician. Usually they are disclosed during the study—roentgenographic or surgical exploratory—of other conditions of the gastrointestinal tract or its contiguous structures. Jung and Boudin report observations made on 7 patients harboring diverticula of the duodenum, accompanied by gastric or duodenal ulcer in four. The observations of the not uncommon coexistence of ulcer and diverticulum in the same patients spurred the authors on to make further studies. A comparison of the usual location of the two pathologic entities disclosed that: (a) diverticula usually are found at the level of the esophagus, the upper half of the stomach, the second, third, and fourth portions of the duodenum, the small intestine, and the descending colon; (b) ulcers usually are located in the liver, esophagus, the lower half of the stomach, the first portion of the duodenum, and the right colon. Biochemically, the environments in which diverticula occur have an alkaline *p*H, but those areas which are ulcer-prone have an acid *p*H. Ulcers, as well as diverticula, may be single or multiple, but they do not overlap in location. Ulcers and diverticula are subject to the same complications of perforation, hemorrhage, and inflammation. Diverticula frequently are the seat of embryonic or aberrant glandular-islet, cells. In either lesion, ulcer or diverticulum, parietal insufficiency plays the important role. —*Edwin J. Pulaski, M.D.*

Inborn and Extraneous Factors in the Etiology of Peptic Ulcer. C. F. W. Illingworth. *J. R. Coll. Surgeons Edinburgh*, 1956, 2: 14.

The author notes that in the case of peptic ulcer "the seed flourishes only on prepared soil" and the extraneous cause(s) of peptic ulcer only acts, or acts most effectively, on a receptive constitution. The typical ulcer patient has a characteristic body habitus—a lean

build, an anxious, lined face, and an intense, hyperalert awareness of his surroundings. The number of ulcer patients whose blood group is "O" is significantly higher than would be expected in a random sampling of the population. This need not mean that having peptic ulcer is due necessarily to having a particular type of blood, but it does infer that ulcer patients tend to be drawn from a distinctive section of the population. For every female with gastric ulcer there are 2 males with gastric ulcer, 4 females with duodenal ulcer, and 16 males with duodenal ulcer. Duodenal ulcer has a peak incidence between the ages of 25 and 35 years, while gastric ulcer typically occurs later in life. Among siblings of ulcer patients, ulcers are found more than twice as often as would be otherwise expected statistically.

Peptic ulcer results either from an increase in the digestive power of the secretory juice, from a decrease in mucosal resistance, or both. In duodenal ulcer experience suggests that the factor of acid erosion is paramount. Conversely, in gastric ulcer the acid secretions are usually normal or low, so the factor of mucosal resistance is believed to be faulty. Both the nervous stimulus transmitted by the vagus nerves and acting through the agency of acetylcholine, and the humoral stimulus originating in the antrum and transmitted by gastrin, suggest that the final trigger substance which actuates the parietal cells is histamine. This is believed to be liberated from the protein-bound form which is stored in such vast quantities in the stomach wall.

Little knowledge exists regarding mucosal susceptibility. The mucosa of the fundus and cardia has high resistance to its own secretion. Toward the pylorus, and especially on the lesser curvature, the resistance falls. Further on, in the duodenum the resistance is even less, while in the jejunum it is minimal. The author speculates that variations in the secretion of a substance, 5-hydroxytryptamine, which profoundly antagonizes the production of acid and provokes a copious flow of mucus, may be concerned with the etiology of peptic ulcer. Scarring from old healed erosions always represents a locus minoris resistentiae, always potentially capable of reactivation.

Gastric juice is secreted by parietal cells, each cell being capable of an all-or-none activity. Evidence is cited to show that the duodenal ulcer patient has about twice the normal number of parietal cells in his stomach wall. This is the inherent constitutional factor—an excess of acid-secreting tissue—which the author believes is the main factor that is responsible for the development of the ulcer under comparatively mild external stress.

Doubt is cast upon the importance of the secretory effects of vagal stimulation, and the belief is expressed that of greater significance in vagal dystonia is the excessive muscle tone, spasm, and ischemia which results.

—*Sheldon Oscar Burman, M.D.*

Malignant Degeneration of Peptic Ulcers in the Clinical Experience of Professor Finsterer (Ueber die maligne Degeneration der Ulcera peptica im Krankengut von Prof. Finsterer). H. WINKLER and H. KOSIC. *Wien. med. Wschr.*, 1956, 106: 837.

IN THE YEARS from 1935 to 1950, 7,163 patients with peptic ulcers were referred to Finsterer and his group in Vienna for treatment. Of this group, 6,815 were operated upon, because it was felt that a study of the malignant degeneration found in this large series would prove to be of value. A total of 2,120 patients with gastric ulcers were observed; 187 (8.82 per cent) of the patients were classified as having ulcers that had undergone malignant degeneration. About 80 per cent were men and 20 per cent were women in both groups. The incidence of malignant degeneration was somewhat higher than that given by other authors, i.e., Henke-Lubarsch, 1 to 2 per cent; Dittrich, 1.2 per cent; Reitter, 2 per cent; Hauser, 2 per cent; Gyankovic, 2.9 per cent; Uebermuth, 2 to 5 per cent; Kalk, 3 to 4 per cent; Küttner, 3 per cent; Lange, 3.4 per cent; Lauber, 3.8 per cent; Brinkman, 5.5 per cent; Auschütz-Konjetzny, 5 per cent; Rosenheim, 8 per cent; Orator, 10 to 15 per cent; Masson, 18 per cent; V. Payer, 26 per cent; Mayo, 54 per cent; Maclarty, 71 per cent; Pauchet and Delort, 78 per cent. Fifty-four per cent of the ulcers were located on the lesser curvature, 22 per cent were prepyloric, 13 per cent on the anterior wall, 8 per cent on the posterior wall, and 3 per cent were juxtapyloric. The size of the ulcers varied from 0.7 centimeters to 5.5 centimeters with an average of 3.1 centimeters. Of the 6,815 patients, 449 had combined duodenal and gastric ulcers, and none of these were noted to have undergone malignant degeneration. Among 4,095 patients operated upon for duodenal ulcer, only 2 were recorded as having had carcinomatous degeneration of their ulcers. The preoperative diagnosis, as determined by x-ray study, was found to be right as often as it was wrong. The average duration of the ulcer symptoms previous to surgery was 5 years for men and 3 years for women.

In order to decrease the incidence of malignant degeneration in gastric ulcer, the authors believe that the presence of a gastric ulcer in a patient with a family history of many cancers should constitute an indication for gastric resection.

—*J. C. Rosenberg, M.D.*

The Sequelae of Gastrectomy for Ulcer; Study Based on 3,000 Patients Operated Upon, with a Late Survey of 953 (Les séquelles de la gastrectomie pour ulcère; étude basée Sur 3,000 cas opérés dont 953 malades revus). R. DE VERNEJOUL, E. HENRY, and R. DEVIN. *Sem. hop. Paris, Ann. chir.*, 1956, 32: 699.

THE AUTHORS have analyzed the data on the late follow-up of 953 patients who were subjected to gastrectomy of the Hofmeister-Finsterer type for ulcer at the Marseilles School of Surgeons. The data were obtained by questionnaires, serial roentgenographic, gastroscopic, and other studies, and detailed interrogations by the authors. The complications derived from their study were grouped as follows: (1) stomal-mechanical, inflammatory, or functional; (2) systemic disorders—metabolic, hematopoetic, and pulmonary tuberculous. In addition to analysis of the incidence of each of these sequelae, the capacity for work of the gastrectomized patients was analyzed. Finally, ways and means for avoiding the complications of gastrectomy are described.

1. Anastomotic dysfunctions: (a) Mechanical difficulties included the "small stomach" syndrome, which constituted the most frequent of mechanical faults,

having occurred in 25 per cent of the cases, and which rarely persisted longer than 3 months postoperatively; reflux in the afferent loop, which occurred in 4.2 per cent of the patients but was asymptomatic in one-third of them; and, in a small (unspecified) number of cases, permanent stenosis which required a second operation and reanastomosis. (b) Inflammatory changes at the site of anastomosis occurred in 8.1 per cent of the cases, in the form of gastritis, "stomitis," jejunitis, or combinations thereof. Radiography is of paramount importance in establishing the presence of these inflammations, and the radiographic findings are described in detail. Preventive measures included gentle handling of tissues by the surgeons to avoid aggravation of already present inflammatory changes, and anticipation of postoperative dietary difficulties by prescribing a diet easy to digest and compatible with the patient's dentition. (c) Functional disturbances included the "dumping syndrome" in about 2 per cent of the patients and were usually ameliorated by diet, rest, and drugs; intolerance to milk (the most common of complications in the authors' experience), sugar, bread, cereals, eggs, alcohol, or tobacco, and usually always present preoperatively; diarrhea, in about 5 per cent, which could be lessened in severity or eliminated by various medications; and ill-defined symptoms, attributed to cholecystitis, liver, or pancreatic disease in 5 per cent. (d) Lastly, stomal ulcer, which occurred in about 2 per cent (17 cases) of the authors' cases, all of whom had duodenal, not gastric ulcer, and which can usually be averted by a well executed exclusion (Finsterer) type of operation.

2. Systemic disorders. (a) Hypoglycemic episodes were noted in 10 per cent of the gastrectomized patients and hypoproteinemia in several, but both were correctible by standard therapeutic regimens; (b) the hypochromic anemia or actual reduction in the body total red cell mass that were observed in several patients responded to antianemic therapy or blood transfusions; (c) pulmonary tuberculosis occurred in less than 1 per cent of the cases in the series; and (d) a weight loss of 5 kilograms or more was recorded in one-fifth of the patients, with no change or gain in weight in the other four-fifths.

Eighty-three of the 953 gastrectomized patients suffered some reduction in the capacity to work, which was temporary or periodic in about one-half and severe or permanent enough in the other half to necessitate frequent rest periods, change to emotionally or physically less strenuous jobs, or institutional care (for patients with pulmonary tuberculosis).

The overall results of gastrectomy in the authors' experience were excellent, good, or passable in about 91 per cent of the cases, and poor or bad in about 9 per cent. A reduction in the incidence of untoward sequelae can be effected by three methods: (1) a more critical selection of cases for operation; (2) improvement in operative technique; and (3) better postoperative care. Serious thought should be given to rejecting for gastrectomy those patients of advanced age, with severe psychic (depressive) disturbances, uncorrected anemia, hypoproteinemia, or tuberculosis. As regards operative technique, in addition to delicate handling of tissues and avoidance of handicaps to wound healing, the creation of a small, instead of a large, gastroenterostomy stoma and of a short, well suspended transmesocolic afferent loop will help to avoid the "dumping" syndrome and other stomal mechanical complications.

Postoperative care is by no means the least important of the three methods, and the mere prescription of a diet is not good therapy. Radiologic examinations to determine how well the gastroenterostomy is functioning, small well selected meals on a 4 to 5 times a day schedule, a high-protein diet containing a sufficient quantity of fat, and the correction of deficits (protein, vitamins, and red blood cell) as they are detected during periodic rechecks, are important elements in obtaining optimal results in post-gastrectomy patients. —*Edwin J. Pulaski, M.D.*

Carcinoma of the Stomach; a Roentgenologic Study Based on 122 Histologically Verified Cases. KALEVI KETTUNEN. *Ann. chir. gyn. fenn.*, 1956, 45: Supp. 9.

THIS ARTICLE consists of a clinical and roentgenologic survey of carcinoma of the stomach. In all, there were 122 cases of proved carcinoma of the stomach during the years 1931 through 1954. The greatest incidence of the disease was in the sixth and seventh decades, during which 66 per cent of the cases occurred. In 60 per cent of the cases, the duration of symptoms was 1 year or less, and in 40 per cent it was more than 1 year. This conforms with the results of other studies showing a duration of more than 1 year in from 30 to 45 per cent of the cases. Eighty-nine of the patients showed achlorhydria or hypochlorhydria. Only 1 patient had free hydrochloric acid in concentrations higher than 45 units.

The author thinks that the most important method for the detection of gastric cancer is x-ray examination. He stresses the difficulties in the examination of the gastric cardia, which is not accessible to direct palpation and pressure. Moreover, in the routine examinations in the Trendelenburg position, the abundant quantity of barium spreading into the cardia hides the smaller growths.

Carcinomas were located in the antrum in 56 per cent of the cases, in the pars media in 40 per cent, and in the fundus in 4 per cent. Eleven per cent of the patients with gastric cancer were previously treated for a peptic ulcer. The author stresses the fact that even cancerous lesions may temporarily improve on medical management.

He also emphasizes the value of gastroscopy in differentiating a superficial spreading carcinoma that fails to impair the contractile activity of the gastric wall due to antral gastritis. He believes that cytologic examination may be of value in doubtful cases, but that the maximum diagnostic accuracy of this technique is only 60 per cent. The article is amply documented with roentgenograms. —*Alan Thal, M.D.*

Notes on Argentaffin (Carcinoid) Tumors; Three Examples in Childhood. REGINALD WEBSTER and ALAN WILLIAMS. *Med. J. Australia*, 1956, 42: 553.

THREE EXAMPLES of argentaffin or "carcinoid" tumors are recorded as having occurred in children aged 7, 10, and 10 years respectively; the tumors were examined with respect to their clinical effects and pathologic features.

The one intestinal and the two appendicular carcinoids reflect, on a very small scale, the determined relative frequency of occurrence of these neoplasms in the appendix and the small intestine respectively.

The histologic characteristics of the tumors are given in detail, their histogenesis is discussed, and the difficulty in forecasting a malignant course by microscopic study is emphasized.

The authors believe that all "carcinoid" or argentaffin tumors are innately malignant, though in their characteristic, slow progress, they may not reach the stage of metastatic spread.

Recent work has been done by which the endocrine activity on the part of advanced and metastasizing argentaffin tumors has been established. The product of the argentaffin cells has been identified. When there are advanced hepatic metastases the following features are present: a syndrome of patchy cyanosis with transient vasodilatation of the skin, tachychardia, hyperperistalsis with diarrhea, and valvular changes in the right side of the heart (pulmonary stenosis). The product of the cells 5-HT is identical with serotonin. The end product (5-HIAA) excreted in the urine can be detected with a paper chromatographic method. —*Edmund R. Donoghue, M.D.*

The Outlook After Massive Resection of the Small Intestine, with a Report of 2 Cases. H. S. TRAFFORD. *Brit. J. Surg.*, 1956, 44: 10.

TWO PATIENTS, one with an estimated 89 per cent and the other with a 93 per cent resection of the small intestine, are presented. The first patient had been subjected to several operative procedures for extensive regional ileitis. The second had a similar disease with only the first 15 to 18 inches of the jejunum remaining after two resections for ileitis and one for gangrenous bowel secondary to intestinal obstruction.

Both patients did rather poorly initially with marked weight loss, anemia, and diarrhea. After a period of adjustment, both gained weight despite the fact that they continued to lose 54 to 58 per cent of their total fat intake in the stool. Diarrhea has remained a minor problem.

Other authors have reported that while there are reports of some successful more extensive resections, the upper limit of safety for removal of small intestine is 50 per cent.

It is suggested that after massive intestinal resection the duodenum and colon assume some of the absorptive functions of the small intestine and the remaining gut may dilate and hypertrophy to some degree, making survival possible. The patients in which the resection has been done in stages appear to respond most satisfactorily. —*Jack A. Thompson, M.D.*

Lipomas of the Cecum (Contributo allo studio dei lipomi del cieco). F. DE BERNARDIS and G. D'AMBROSIO. *Arch. ital. mal. app. diger.*, 1956, 22: 251.

THE AUTHORS present material on 2 cases of lipoma of the cecum. In both patients a preoperative diagnosis of pedunculated tumor, probably benign, was obtained by a barium enema study. A right hemicolectomy was performed in both cases. In the second patient the cecum was opened to determine the nature of the lesion, and when it was found to be ulcerative in nature a hemicolectomy rather than a local excision was performed.

After reviewing the subject the authors conclude that hemicolectomy is the procedure of choice as regards treatment, since it affords the maximum degree of safety against malignant degeneration. They also believe that diagnosis by roentgenography can be made preoperatively. The opinion of various authors who maintain that a diagnosis is almost impossible should be modified.

—*Lucian J. Fronduti, M.D.*

Indications for the Surgical Treatment of Sigmoid Diverticulitis and Its Complications (Les indications du traitement chirurgical des diverticulites du sigmoïde et de leurs complications). L. DELOYERS. *Acta chir. belg.*, 1956, 55: 396.

AFTER THE AGE OF 50, about 5 to 10 per cent of the population has sigmoid diverticula and of this group, only about 20 per cent develops diverticulitis. Acute, subacute, and chronic stages are seen with the complications of abscess, adhesion, obstruction, external or internal fistula, hemorrhage, and cancer in the same region.

Surgical attack is directed toward the complications. Cases are cited to show complete reversibility of the inflammatory reaction in a matter of 3 or 4 months. Case histories to illustrate the other complications are presented. If the segment is considered to be inoperable, a sigmoid colostomy of the permanent type is established; if operable, a cecostomy for temporary defunction is established. Multiple operative sessions are favored. In case of primary resection and anastomosis, a transverse colostomy is established to spare the suture line. A three stage operation of drainage and transverse colostomy, followed by colectomy and later by colostomy closure is recommended in case of severe inflammation in an operable case. Temporary colostomy without later resection is not advised unless the roentgenogram shows flexible walls and a normal caliber. This is unusual.

Resection should be done in 3 months after colostomy ordinarily, but a 6 months' interval is better in severe cases. The one stage operation is reserved for cases in the interval. Acute obstruction calls for the three stage procedure. Vesicosigmoid fistula is serious and requires transverse colostomy. The fistula then often closes spontaneously. This is part of the three stage procedure.

Hemorrhage in diverticulitis rarely is severe and usually stops spontaneously. In elective cases bowel preparation with nonabsorbable sulfonamides is indicated, and in all cases antibiotics play an important role. Localized abscesses are detected by hyperphospheremia. —*Warner F. Bowers, M.D.*

Diverticulosis and Diverticulitis of the Colon. M. M. ZINNINGER. *Am. Surgeon*, 1956, 22: 683.

DIVERTICULA OF THE COLON are relatively common after the age of 40, and are usually asymptomatic. In certain instances, serious complications may arise and present a problem in management. Most of the diverticula occur in the sigmoid and descending colon and are the result of out-pouching of the mucosa through defects in the muscularis alongside perforating arteries

and veins. These lesions are most often diagnosed roentgenographically with barium studies of the colon.

When symptoms develop, they may vary widely as they depend upon many factors. The most common complications arise as a result of inflammation and include: free perforation with peritonitis, localized abscess, dissecting fistulas to other viscera or to the skin surface, and low grade intestinal obstruction due to scarring and fibrosis of the wall of the bowel. Hemorrhage of severe nature and symptoms of an irritable colon may also occur. The nature and extent of the complication are dependent upon the extent of involvement and degree of spontaneous regression of the inflammatory process.

In acute perforation due to inflammation, the symptoms resemble those that occur in a patient with acute appendicitis on the left side. The usual procedure is to explore the area through an incision in the left lower quadrant, establish the diagnosis, insert a drain, and perform a diverting transverse colostomy on the right side. Exteriorization of the area of perforation may be accomplished in exceptional instances, but it is usually wise, even with the present day use of antibiotics, not to disturb the infected local area.

If the patient is seen 18 to 24 hours after the onset of illness, without signs of spreading peritonitis, and it is thought that a localized abscess is present rather than a free perforation, bed rest, gastric suction, and antibiotic therapy may be utilized. Such localized abscesses usually maintain their communication with the bowel, and if the infectious process is controlled, the abscess may drain into the bowel.

When fistulous tracts to other viscera have become evident, the safest and best method of treatment requires three operative procedures; initially, a proximal diverting colostomy, secondarily, resection of the involved bowel with closure or resection of the fistula, and, finally, closure of the proximal colostomy. In certain selected instances it may be possible to close the fistula, resect the involved colon, and perform a primary anastomosis in one stage. This avoids considerable morbidity and disability for the properly selected individual patient.

When colonic obstruction develops in the presence of diverticula, the surgeon must beware of the possibility of an underlying neoplasm. The diagnosis may be quite difficult and sigmoidoscopy is rarely helpful. However, on barium enema, obstruction due to diverticulitis generally shows a comparatively long area of partial obstruction without the shelflike edge or mucosal distortion observed in cancer. In obstruction, the management is quite similar to that advised when a fistula is present—initial proximal colostomy, secondary resection of the lesion, and, finally, closure of the colostomy. When a neoplasm is present or suspected, the interval between the first and the second procedure should be diminished to 4 to 6 weeks rather than the usual 3 to 4 months sometimes advocated.

It must be recognized that in every case of bleeding from the colon the surgeon must rule out the presence of cancer. However, there are many verified cases in which massive colonic bleeding apparently came from bleeding diverticula or from a single diverticulum. This bleeding may occur in the absence of significant infection. When there is massive rectal bleeding without other symptoms and the endoscopic and roentgenologic studies show no cause for bleeding other than diverticula, these diverticula may be accepted as the source of hemorrhage. After hemorrhage has ceased, watchful waiting for further bleeding or other signs is indicated. More active therapy, such as exploratory laparotomy, should be resorted to only if further symptoms or signs occur. —*Jack A. Thompson, M.D.*

The Diagnosis of Carcinoma of the Colon and Rectum; a Review of 714 Cases. E. G. MUIR. *Brit. J. Surg.*, 1956, 44: 1.

THE CLASSIC FINDINGS in carcinoma of the colon (alteration in bowel habit, pain, and blood in the stool) often are ascribed to other causes or go unnoticed by both patient and physician. This occurs despite the fact that the patient's future depends initially upon his own awareness that something is wrong and, secondarily, on the practitioner's suspicion of these phenomena.

In this series of 714 patients, there were 109 carcinomas in the right colon, 74 in the left colon, 114 in the sigmoid, and 417 in the rectum and rectosigmoid. A detailed statistical analysis and discussion of the incidence of abdominal pain, bowel habit complaints, vomiting, bleeding, weight loss, faintness and/or peritonitis, mucus in the stool, and tenesmus were given. A study of these findings and the duration of symptoms was undertaken in each of the above series of cases, and a comparison was made of the results in the various locations.

Pain, vomiting, faintness, or lassitude was common in lesions of the right colon and less so in those of the left. The complaints of change in the bowel habit and blood in the stool were found infrequently in neoplasms of the right colon, but tended to rise in frequency with a more distal location of the lesion. Acute obstruction and peritonitis were more common with sigmoid growths. The passage of mucus was occasionally noted with sigmoid lesions and commonly with carcinoma of the rectum, but not recorded with growths in other sites. A palpable mass was most frequently present with carcinoma of the right colon.

The average duration of the symptoms prior to hospital admission was 5.5 months for the lesions of the right and left colon, 6.5 months for the sigmoid, and 5.5 months for rectal neoplasms. The average duration of symptoms prior to surgery was believed to be of little prognostic value.

It is interesting that perhaps as high as 20 per cent of the patients referred to the hospital for a rectal complaint had not previously received a rectal examination. This assumes added proportions when it is realized that these statistics confirm the frequently recorded fact that 50 per cent of all carcinomas of the colon can be reached with the examining finger, and another 20 to 25 per cent with the sigmoidoscope.

—*Jack A. Thompson, M.D.*

Carcinoma in Small Polyps of the Distal Colon; a Sigmoidoscopic and Histologic Study. MARIE ORTMAYER. *Gastroenterology*, 1956, 31: 404.

THE CLINICAL IMPRESSION that benign "polyps" of the colon are forerunners of ulcerating carcinoma of the colon has been generally expressed for some time. While direct proof is lacking, indirect evidence fre-

quently cited includes: (1) the existence of undoubted carcinoma in lesions adjacent to smaller benign polyps, (2) the development of full-blown carcinoma in a polyp from which a previous biopsy was benign, (3) the occurrence of carcinoma in familial polyposis, well above the average incidence for colon carcinoma at similar age levels, (4) the high incidence of carcinoma in long-standing ulcerative colitis, (5) the fact that the sites of polyps in the colon parallel those of carcinoma in the colon and the incidence parallels with age, but a decade earlier for the polyp, and (6) the finding of benign and malignant epithelium juxtaposed in undoubted polypoid carcinoma of the colon.

A large number of colonic polyps will be found if all adult patients are routinely sigmoidoscoped. One hundred and seventy-nine asymptomatic, small polyps (only 17 larger than 1 cm. in diameter) were removed from women between the ages of 26 and 61 years. Histological examination should be and was performed on all the polyps removed. Five of the 179 were nonepithelial tumors (lymphomas and fibromas), 146 were benign, 24 carcinomatous, 3 carcinoid, and only 1 tumor was an ulcerating, infiltrating carcinomatous polyp. Seventy-eight per cent were found at or below 15 cm., while 65 per cent occurred at the 10 to 15 cm. height. The cause for the high frequency of polyps in this comparatively short segment is obscure. The incidence of carcinomatous change increased as the size of the polyp increased.

For clearness of understanding, the term "adenoma," whether benign or malignant, was used to denote the tumorous proliferation of predominantly that type of columnar epithelium found in the depths of the normal colonic glands, whereas "papilloma" referred to proliferation of surface type epithelium. When both forms of cells were present with neither predominating, the term "adenopapilloma" was utilized.

Of the 24 carcinomatous polyps, 10 were carcinomatous adenomas and 14 were carcinomatous adenopapillomas; there were no pure carcinomatous papillomas. There were no gross characteristics other than size, which differentiated the benign from the malignant polyps on sigmoidoscopy.

These lesions were all small and were removed with biopsy forceps without electrofulguration; the procedure was safe from bleeding and "only an occasional recurrence of polyps" was noted. More extensive removal by resection was advised if the lesion had exophytic growth characteristics.

—*Jack A. Thompson, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

Peroperative Manometry and Radiology in Biliary Tract Disorders. PIERRE MALLET-GUY and J. DUDFIELD ROSE. *Brit. J. Surg.*, 1956, 44: 55.

IT was not long after the first successful cholecystostomy (Kocher, 1878) and the first cholecystectomy (Langenbuch, 1882) that Magie (1919) questioned the advisability of removing what seemed to be a healthy gallbladder merely because it contained stones. Since then, there has been a spate of articles emphasizing the significant number of patients who continue to have biliary pain after cholecystectomy. In 1938 Hellstrøm of Stockholm reviewed 1,041 cases and noted that 30 per cent of the patients had biliary pain after cholecystectomy. In 1943 Saunders stated that only 10 per cent of a series of 3,000 patients had pain postoperatively. In 1953 Myers reported a figure of 20 per cent, but added that it rose to 60 per cent in those who had had a noncalculous cholecystitis. In 1955 Hess stated that only 43 per cent were free from pain after cholecystectomy. Clearly, cholecystectomy leaves much to be desired. Realizing that disordered function in the presence of apparently normal morphology may constitute the overlooked pathology which is left uncorrected when only the current, standard technique of cholecystectomy is employed, the authors have enlarged the scope of operative investigation.

Initially they measure the pressure within the biliary tree by cannulating the cystic duct, or the fundus of the gallbladder if the organ appears normal. The cannula must not be less than 2.5 mm. in diameter. Five cubic centimeters of saline solution are injected into one arm of a T junction. Some of the solution descends into the anchored cannula and some rises into the manometer which resembles a self-recording barograph and records on a revolving drum. Immediately upon injection of the saline solution the pressure in the system rises. It steadily falls as equilibrium is reached between the hydraulic force and the tone of the sphincter mechanism. At equilibrium a steady line appears. Common duct pressure is usually between 8 and 14 cm. of water, and in the normal gallbladder the pressure is usually 18 cm. The maneuver is repeated several times until a series of stabilized pressures is nearly uniform.

Next, the authors inject 20 c.c. of lipiodol through the cannula and obtain an operative cholangiogram. Even if the patient has had a negative preoperative, intravenous cholangiogram, the authors recommend a repeat preoperative study. In a series of 166 patients, 73 had a normal preoperative cholangiogram but in only 21 was the biliary tree found to be normal both functionally and anatomically at surgery. Normally the common duct will appear 3 to 4 mm. in width including the peristaltic waves. The sphincter of Oddi will normally appear as a distinct, but not excessive, narrowing.

Functional hypertonia is confirmed by infiltrating the terminal vagal fibers of the sphincter of Oddi with a local anesthetic and ascertaining if this reduces the elevated biliary pressure. If not, then the cause of the hypertonia is concluded to be organic.

On the other hand, if the pressure in the common duct is found to be 5 cm. of water and the duct is dilated with a widely patent sphincter, a hypotonic state is recognized. It may be idiopathic or secondary to lithiasis or pancreatitis.

Assessment of these diagnostic maneuvers was made in two series of the authors. Patients with postcholecystectomy symptoms were reoperated upon. At Lyons 48 per cent of 58 patients were found to have a morphological disturbance. There were 8 with calculi, 8 with chronic pancreatitis, 4 with stricture, 3 with incomplete cholecystectomy, 3 with hepatitis, 1 patient with an ampullary carcinoma, and 1 with a duodenal adhesion. Forty-seven per cent were found

to have a functional abnormality, hypertonia in 10 and hypotonia in 17. No obvious cause for the postcholecystectomy symptoms was found in 3 patients (5 per cent).

At Newcastle-upon-Tyne, 22 patients with similar conditions were explored. Hypertonia was detected in 1 patient, and hypotonia in 7 patients so that 36.5 per cent of the cases proved to be functional. Fifty-nine per cent of the cases proved to be morphologically detectable, that is, there were 3 patients with calculi, 2 with a cystic duct stump, 1 patient with duodenal ulcer, 4 patients with chronic pancreatitis, and 3 with cholangiohepatitis. There was only one negative exploration (4.5 per cent). —*Everett Shocket, M.D.*

Exploration of the Bile Passages Following Cholecystectomy. J. E. P. M. REGOUT and G. WATERBORG. *Arch. chir. Neerl.*, 1956, 8: 219.

THE RETURN of symptoms following operation on the biliary system for lithiasis is a phenomenon which, according to the literature, varies in frequency from 10 to 45 per cent. This so-called postcholecystectomy syndrome is attributable to the following causes: (1) dyskinesia of the bile passages, spasm or fibrosis of the sphincter of Oddi, or strictures of the bile passages; (2) lithiasis of the common bile duct or the hepatic duct, either overlooked at the primary operation or newly formed; (3) dilation of a cystic duct stump, sometimes associated with lithiasis or inflammation; (4) cholangitis, hepatitis, or anomalies of the pancreas; (5) local inflammatory phenomena, e.g., duodenal ulcer or adhesions.

The subjective changes manifest themselves by occasional dyspeptic symptoms all the way to typical colic with biliary stasis and intermittent fever. Some patients also exhibit periodic diarrhea. Diagnosis has recently been made somewhat easier with the advent of the new contrast medium, biligrafin, which enables one to obtain cholangiograms after a cholecystectomy.

The number of secondary operations has remained small compared with the frequent occurrence of symptoms following cholecystectomy. In the authors' review of the literature they find that one writer reports secondary operations in 2.7 per cent of 5,500 cholecystectomies and another writer in 5.2 per cent of 5,600 cholecystectomies. The authors personally observed 2,368 cases of cholecystectomy of which 36 had secondary laparotomy. In their series the most common finding was the presence of concretions in the common duct. This appears to be true of others reporting on this subject, and long cystic duct stumps and stricture or stenosis of the bile passages account for the next most common findings at secondary laparotomy. Garlock, for instance, removed a remnant of the cystic duct by secondary operation in 30 cases with disappearance of the symptoms in 24 of the patients.

In 1938 Lahey extended the indications for exploration of biliary disturbances, and since this time the cases of lithiasis of the common duct, discovered during operation, have greatly increased in frequency. Exploration of the common bile duct is carried out in 40 to 50 per cent of the patients requiring surgery of the gallbladder, and the authors state that stones are found in the common bile duct in 16 to 20 per cent. In the authors' clinic, during the period from 1935 to 1955, concretions were found in the common bile duct in 34 per cent of 2,368 cases of cholecystectomy. They list their indications for exploration of the common duct as a history of jaundice, small concretions in the gallbladder, a wide cystic duct, a dilated or distended common duct, or palpable concretions in the bile passages.

During the period from 1946 to 1954, 36 patients had secondary operation at the authors' clinic, because serious symptoms recurred following cholecystectomy or because a postoperative cholangiogram revealed residual concretions in the bile passages. In 36 secondary operations, concretions were found in the bile passages in 24 patients. In the group of patients who had concretions in the common bile duct at secondary laparotomy, symptoms recurred after an average period of 17 months, with attacks of colic in 45 per cent and jaundice in 63 per cent. The concretions were localized in the common bile duct in 21 patients, and in the hepatic duct in 3.

Among the 12 cases of secondary operation in which neither exploration at the original operation nor cholangiography demonstrated stones in the bile passages, there was one case of stricture of the common bile duct and 2 cases of an excessively long stump of cystic duct. Seven cases revealed findings indicative of cholangitis, and in 2 cases there was no demonstrable cause. —*James H. Holman, M.D.*

Intravenous Cholangiocholecystography with "Biligrafin"; Its Value as Compared with the Oral Contrast Method. R. W. W. HARDIE and M. ISRAELSKI. *Brit. M. J.*, 1956, 2: 779.

RESULTS OF EXAMINATION of the biliary tract with the intravenous use of biligrafin (cholografin) in 75 patients with intact gallbladders and in 31 postcholecystectomy patients have been carefully evaluated by the authors. Forty milliliters of biligrafin were used routinely, the injection being completed in 3 minutes. There were no serious reactions, but occasionally nausea, a feeling of heat, or a mild rash was noted. Films for visualization of the bile ducts were taken 30 and 50 minutes after the injection, and of the gallbladder up to 3 hours after it. When cholangiography alone was done, the patient was examined in the fasting state; when cholecystography was also desired, a fatty meal was given 1.5 hours before the injection.

Of the 75 patients with intact gallbladders examined by this method, all were previously examined by oral cholecystography so that a comparison of the values of the two methods could be made. In 58 of these the oral method had resulted in either nonvisualization or in such faint visualization as to be of no diagnostic aid. The gallbladder filled in 27 of these 58, stones being shown in 20 (16 in the gallbladder alone, 1 stone in the common bile duct alone, and 3 stones in both). In 28 of the 58 cases the hepatic and common ducts only filled, which suggested obstruction of the cystic duct. Such an obstruction was proved in each case at operation and resulted from a calculus in all of the cases. In the remaining 3 cases no visualization of the biliary tree resulted with biligrafin. One of the 3 patients had advanced cirrhosis, a second had recent obstructive jaundice, and the third had recently under-

gone local excision of a tumor of the ampulla of Vater which was believed to result in rapid emptying of the contents of the common duct into the duodenum.

In 17 patients oral cholecystography had been successful, and biligrafin studies were done either because of the desire for more precise anatomic detail of the gallbladder or because of the suspicion of calculi in the common duct. Stones in the common duct were detected in one patient. In another neither the gallbladder not the ducts were visualized. In the remaining 15 patients normal common bile ducts were demonstrated.

The second main group was comprised of 31 postcholecystectomy patients. Eleven of these had no symptoms and were examined with biligrafin to determine the normal findings. In most of these a slender duct about 3 mm. in diameter was found, but in a few the duct diameters measured up to 10 mm.

The remaining 20 patients had symptoms. Five of these proved to have common duct stones, and in 4 of the 5 these were clearly shown preoperatively by the biligrafin study. In one the stone was missed by this method, but was recovered at operation, although in a later review of the films the stone was detected. In one patient a complicated network of dilated hepatic ducts was seen without demonstration of the common duct, and at operation an extensively fibrosed common duct was found. In 4 patients, small cystic duct stumps were found. In the 10 remaining patients normal ducts were shown.

The authors conclude that in patients with intact gallbladders the intravenous method provides more useful information than the oral technique and eliminates the factor of intestinal absorption; therefore, it could be used as the primary method of roentgenologic investigation. After cholecystectomy, biligrafin study is the only practical nonoperative method for examination of the bile ducts.

—*Thomas E. Boles, Jr., M.D.*

Clinical Studies of the Natural History of Acute Pancreatitis. VAN G. KADEN and JOHN M. HOWARD. *Arch. Surg.*, 1956, 73: 269.

TO DETERMINE the natural course of acute pancreatitis follow-up studies were carried out on 100 patients who had been treated for the disease. In 87 patients the presence or absence of gallstones was determined, with 41 per cent of these having stones and 59 per cent without stones. In both groups there was a high percentage of recurrence. Two general syndromes were recognized in the follow-up study; one related to the group with stones and one to the group without stones.

In the group with stones 3 out of every 4 were women, while in pancreatitis without stones the sex distribution was equal. Of the patients without stones, 37 per cent had chronic alcoholism. In those with stones only one patient (3 per cent) had such a history. In those without stones 8 per cent developed pseudocyst formation and 16 per cent had pancreatic calcification. In the cholelithiasis group none of the patients developed pseudocysts and only one developed pancreatic calcification. This one patient was the only cholelithiasis patient with alcoholism, and it was felt that his pancreatitis was caused by the latter and that the gallbladder disease was coincidental.

A further difference between the two groups was their response to surgery of the biliary tract. Of 30 patients with cholelithiasis who underwent cholecystectomy and choledochostomy when indicated, only one had definite recurrence of acute pancreatitis, and that one was the alcoholic. A second patient had one attack of pain 3 months after surgery, but the serum amylase was normal and he remained asymptomatic for the next 4 years. In the group without biliary tract disease, 9 patients had cholecystectomy and 3 of these had recurrent pancreatitis later. This 33 per cent recurrence rate approaches the natural incidence of recurrence.

These observations suggest that pancreatitis is likely to recur regardless of the etiology. In patients in whom the biliary tract disease is the apparent main factor in the etiology, cholecystectomy and choledochostomy when indicated, are effective in preventing recurrences. In patients with pancreatitis and normal biliary tracts, such surgery is of little assistance. Therefore, after an attack of pancreatitis cholecystograms are indicated. If stones are seen or if nonvisualization persists for a month after surgery cholecystectomy and perhaps choledochostomy are indicated. In patients with pancreatitis and a normal biliary tree removal of the gallbladder does not appear to prevent recurrence.

—*Stanley W. Tuell, M.D.*

Experience with Resection of the Pancreas in the Treatment of Chronic Relapsing Pancreatitis. WILLIAM P. LONGMIRE, JR., PAUL H. JORDAN, JR., and JOHN D. BRIGGS. *Ann. Surg.*, 1956, 144: 681.

DISSATISFACTION with the results of other procedures for cure of relapsing pancreatitis led to the performance of total pancreatotomy in 8 patients with that disease. In 5, pancreaticoduodenectomy was carried out, with sparing of the tail of the pancreas. In all of the patients the remaining pancreas was adequate to supply insulin needs, but in 2 it was inadequate to supply the digestive ferments needed for normal digestion. The pancreatic remnant in 3 patients was palpably diseased and may have been responsible for mild, recurrent symptoms; yet it is thought that an attempt to preserve such tissue for its endocrine and exocrine functions is worthwhile. Total pancreatectomy was performed when the tissues of the tail of the pancreas were destroyed beyond function; this occurred in 3 patients.

The radical operations were difficult and full of risks. In 9 cases there were no operative deaths, but in 1 case operation was not completed because the portal vein was damaged. There are difficult problems in the management of diabetes when the whole gland is removed. The maintenance of adequate nutrition without antogenous pancreatic enzymes is assisted by the use of pancreatic supplements. Of those tried, viokase was the best. Liver damage was not observed, nor were signs of the degenerative diseases occurring in spontaneous diabetes seen during the follow-ups up to 5.5 years.

In 5 cases the results were good and in 2 they were fair. One patient died 4 months after the operation from complications of diabetes.

—*Leonard D. Rosenman, M.D.*

The Pathogenesis of Acute Necrotizing Hemorrhagic Pancreatitis; an Experimental Study. PAUL NEMIR, JR., and DAVID L. DRABKIN. *Surgery*, 1956, 40: 171.

THE INJECTION of fresh bile into the ligated major pancreatic duct of the dog produces edematous interstitial pancreatitis. However, fulminating acute necrotizing hemorrhagic pancreatitis does not occur under these conditions.

In previous experiments on strangulating intestinal obstruction, the authors found that an abnormal hemin pigment appeared eventually in the blood of the animals and that a similar, highly toxic pigment could be produced by incubating blood with activated pancreatic juice for 36 hours at 37.5 degrees (activated with enterokinase, succus entericus, or bile). When this mixture was injected into the ligated pancreatic duct, fatal hemorrhagic pancreatitis ensued. A similar result occurred with mixtures of activated pancreatic juice and plasma; however, the injection of blood alone or activated pancreatic juice alone did not produce hemorrhagic pancreatitis.

The authors summarize the experiments of others, indicating that an element of vascular damage is necessary in addition to duct obstruction to produce the hemorrhagic variety of the disease. They point out that their own results are in accord, and, in addition, they demonstrate a specific toxic substance, presumably formed when, as a result of ischemia and vessel wall damage, blood comes into contact with pancreatic juice. Attempts to delineate the role of the bacterial factor in the disease were not conclusive.

—Hermes C. Grillo, M.D.

Therapeutic and Diagnostic Value of Splanchnic Nerve Block in Acute Necrosis of the Pancreas (Sul valore diagnostico e terapeutico del blocco anestetico dei nervi splancnici nella necrosi acuta del pancreas). EUGENIO BEZZI. *L'ateneo parmense*, 1956, 27: 530.

THE AUTHOR reports on 3 cases of severe pancreatitis treated by splanchnic block. All three patients were considered to have benefited by this procedure. They were operated upon because of severe pain and an indefinite preoperative diagnosis. One of them died.

A review of the literature is presented as well as the technique for performing the block. The author believes that the block of the splanchnic sympathetic nerves has diagnostic as well as therapeutic value.

—Lucian J. Fronduti, M.D.

Recent Advances in the Sphere of Pancreatic Fibrosis with Bronchiectasis; Synonyms: Enterobroncho-pancreaticofibrosis, Mucoviscidosis (Récentes acquisitions dans le domaine de la fibrose pancréatique avec bronchectasies; synonymes: dysporia entero-broncho-pancreatica, mucoviscidose). G. FANCONI, E. ROSSI, and A. PRADER. *Schweiz. med. Wschr.*, 1956, 86: 1187.

PANCREATIC FIBROSIS with bronchiectasis, which is of hereditary familial origin, is reviewed from the standpoints of clinical manifestations, differential diagnosis, treatment, and recent advances in knowledge. The senior author is a pioneer investigator of this syndrome, and, in fact, gave it its descriptive name, "familial pancreatic fibrosis with bronchiectasis."

Fibrocystic disease of the pancreas, or mucoviscidosis, has no geographic or racial predilection, and the age and social status of the parents are noncontributory. The first-born are most frequently affected. The syndrome occurs in a frequency of 1/1,000 to 1/10,000 births, and there is a hereditary familial tendency. According to Bodian and Farber, the inherited defect is an intracellular enzymatic aberration, which brings about abnormal secretion of mucus-producing glands. Viscid mucus is the result, and the obstruction of the secretions which it causes results in secondary dilatation of the pancreatic canals and of the bronchioles. Following this diminution or complete cessation of the exocrine secretions of the pancreas, tissue necrosis, and fibrosis occur, but the cells of Langerhans are often spared. In the respiratory tree cylindrical and sacular dilatations of the terminal bronchioles are observed, and these are frequently subjected to superinfections.

This syndrome, according to Andersen, has the following clinical classification: group 1, newborn; group 2, infants from 1 week up to 6 months of age; group 3, infants from 6 months up to 2 years of age; and group 4, all those of greater ages. In group 1, the disease is manifested in the form of meconium ileus. In the second and third groups, respiratory symptoms soon become evident and are associated with predominantly respiratory, intestinal, or mixed signs. In group 4 the survivors reveal the fully developed syndrome of pancreatic fibrosis with bronchiectasis. Most cases are diagnosed at the close of the first year of life, and most infants die of the condition when they have reached the age of one or 2 years, although a few cases of survival of individuals up to the ages of 20 to 25 years are on record.

The clinical symptoms of pancreatic fibrosis in other than the newborn may be cardinal or secondary; the cardinal symptoms include failure to gain weight and height, a distended abdomen, copious malodorous, greasy stools, and a chronic, violent cough of the whooping type. The secondary symptoms include abundant salivation, profuse perspiration, fecal-like body odor, rectal prolapse, and pseudosymptoms of appendicitis or of an acute surgical abdomen. There are also the usual signs of hypoxia, edema, and hepatic cirrhosis.

The laboratory methods for the determination of enzymatic activity in the duodenal contents are described in detail, as are a battery of indirect tests. The latter are important since duodenal intubation in the infant is not always an easy thing to do. Attention is directed to the importance of bacteriologic studies of the bronchial and intestinal flora, especially for the detection of antibiotic-resistant staphylococcal superinfection which may be rapidly fatal. Electrolyte alterations in the saliva may favor the colonization of the mouth and upper respiratory tract by the staphylococci. Antibiotic therapy is helpful in controlling staphylococcal superinfections and should be employed on proper indications. There is general agreement that the capacity of antibiotic therapy to control these staphylococcal infections is an important factor in the increased survival of infants and children with this entity.

Roentgenograms of the lungs, characteristically, at first show atelectasis and emphysema, especially of the lower, but often of all, the lobes. Later the con-

sequences of superinfection are seen, including bronchitis and bronchopneumonia, and still later fibrotic changes, most frequently of the right superior lobe. Pneumothorax follows rupture of emphysematous bullae. Bronchiectasis can be demonstrated by the use of contrast media but this procedure is poorly tolerated and is not recommended. Electrocardiograms show signs of overload of the right heart and, done serially, are important guides to prognosis.

As regards pathologic anatomy, the changes in this disease occur not only in the pancreas and in the bronchioles, but also in all mucous, sweat, and saliva-secreting glands. Now that longer survival is occurring as the result of antibiotic control of staphylococcal infections, hepatic lesions typical of cirrhosis are frequently seen.

The differential diagnosis is mainly between mucoviscidosis and coeliac disease. When the manifestations are mostly pulmonary, whooping cough must be ruled out. Duodenal drainage and chemical analyses are especially helpful in difficult or borderline cases. Therapy includes: (1) normal diet, or one poor in fats and preferably high in calories; (2) pancreatic extracts following each meal; (3) fat soluble vitamins (A, D, K); (4) long-term antibiotic therapy, preferably guided by culture-sensitivity tests; and (5) antibiotics, enzymes (such as streptokinase-streptodornase), and other topically applied adjuvants for inflammations of the respiratory tract.

—*Edwin J. Pulaski, M.D.*

The Cystadenoma and Related Nonfunctional Tumors of the Pancreas; Pathogenesis, Classification, and Significance. GEORGE G. GLENNER and G. KENNETH MALLORY. *Cancer*, Philadelphia, 1956, 9: 980.

THIRTY-FIVE instances of nonfunctional adenomas and of related tumors of the pancreas were culled from the files of several Boston hospitals for this study which is concerned primarily with the pathogensis and particularly with the significance of these lesions in relationship to malignant conditions.

Cystadenomas are true neoplasms that arise anew. The cysts are usually lined by cuboidal or columnar epithelium. Confusion exists regarding a preferable terminology for describing cystadenomas that grossly appear to be solid but prove to be cystic on microscopic examination. These solid cystadenomas are characterized by a thick fibrous capsule, whereas the grossly cystic cystadenomas either are devoid of a true capsule or it is quite thin.

Theories abound as to the pathogenesis of the cystadenoma. Misplaced cells of the urogenital fold, aberrant Brunner's glands, embryonic rests, acinar cells, duct epithelium, each has been suggested at one time or another. Only the latter origin permits satisfactory explanation of the columnar cells, goblet cells, and the absence of zymogen-containing cells that characterize the cells of cystadenoma.

Direct continuity between a cyst and a nearby intralobular duct, with continuous epithelium throughout, is reported by the authors who affirm the pathogenesis of cystadenoma to be from proliferating pancreatic-duct epithelium.

If the lesion arises deep in the pancreas its expansion is restricted. It compresses the surrounding pancreatic tissue into a thick capsule, and it appears as a solid cystadenoma. More peripheral lesions are not restricted from expanding. There is less tissue to be compressed into a capsule and thus these surface tumors appear grossly cystic with thin capsules.

Duct cystadenomas may be simple or papillary. The papillary type contains classical projections into the lumina of the cysts and is a more actively proliferating neoplasm. Instances of carcinoma arising in cystadenomas have been characterized by the presence of at least one focus of papillary proliferation. Approximately 32 per cent of duct cystadenomas are papillary and are to be regarded as potentially or actually malignant.

Acinar adenomas, which the authors prefer to call acinar adenamatous hyperplasia, also may represent an incipient malignant change. Most pancreatic carcinomas, however, apparently originate from the duct cell.

—*Everett Shocket, M.D.*

The Syndrome of Congenital Absence of the Spleen with Associated Cardiovascular and Gastroenteric Anomalies. MARY JANE AGUILAR, H. BRODIE STEPHENS, and JACKSON T. CRANE. *Circulation*, 1956, 14: 520.

ALTHOUGH CONGENITAL ABSENCE of the spleen is rare, its occurrence is invariably associated with other and frequently multiple anomalies of the cardiovascular and gastroenteric systems. Twenty-seven reported cases are carefully reviewed from the pathologic standpoint. The similarity in the anatomic findings in these cases is very striking. Malrotation of the gastrointestinal tract was frequent and was accompanied by anomalies of fixation. The lobes of the liver were mirror images of each other in several instances with the gallbladder in the midline. In other cases there was a levoposition of the liver and gallbladder. The cardiac malformation was of the cor biloculare type, in most instances with an atrioventricularis communis, anomalous venous return to the heart, and pulmonary stenosis or atresia. Other cardiovascular anomalies included transposition of the great vessels, truncus arteriosus, and the aortic arch on the right side. Twenty of the 27 patients died in the first year of life.

Three additional cases are recorded in detail. The first one was that of a 20 month old female who had had a murmur since birth and cyanosis since she was one week of age. Marked polycythemia was present. Cardioangiography showed a single ventricle with immediate filling of the aorta and very little passage of dye to the pulmonary artery. At autopsy, congenital heart disease with atrioventricularis communis, transposition of the great vessels, infundibular stenosis, and anomalous venous return were diagnosed in addition to absence of the spleen. Other findings were partial situs inversus involving the liver, pancreas, stomach, and duodenum; abnormal mesenteric attachment of the pancreas and duodenum; and accessory lobes of the lungs.

The findings in the 2 other patients, aged 3 months and 5 days, respectively, were quite similar. The cardiac malformation in the former was similar to that in the first patient, the aortic arch was on the right side, and the innominate artery originated on the left side. The latter patient's condition was also quite similar, but coarctation of the aorta was also present. The

anomalies of rotation and fixation of the gastroenteric systems in all 3 patients were essentially the same.

The presence of certain hematologic abnormalities suggest the absence of the spleen. These include target cells, decreased osmotic fragility, Howell-Jolly bodies, transient normoblastemia, siderocytosis, and leucocytosis. Such findings in a case with partial situs inversus of the abdominal viscera suggest the probability of congenital heart disease of the type described. Embryologically, these associated anomalies stem from a developmental defect beginning in the fifth week of gestation.

Consideration should be given to an aortopulmonary shunt in such patients, inasmuch as a decreased flow of arterial blood to the lungs occurs in the great maiority because of pulmonary atresia or stenosis.

—*Thomas E. Boles, Jr., M.D.*

Hydatid Disease of the Spleen with Spread to the Thorax by Rupture into the Pleural Cavity and Bronchi (Hidatidosis esplenica a evolucion toracica con rotura en pleura y bronquios). ALEJANDRO H. VILLEGAS and EDUARDO SCHIEPPATI. *Bol. Soc. argent. cir.*, 1956, 17: 2.

THE AUTHORS state that the spread of hydatid disease of the spleen to the thorax is unusual and rare, especially in the light of the relative infrequence of echinococcus disease of the spleen itself. They mention that Morel, in his extensive survey of the world literature (in 1941), was able to find only 17 cases of hydatid disease of the spleen. Rupture into the thorax occurred in only 5 of these. In the experience of the Institute of Thoracic Surgery, which has consisted of more than 250 cases of thoracic hydatid disease, from a survey of the world literature for the past 5 years, and on the basis of personal communications with other Argentinian surgeons, this lesion is considered most uncommon.

The patient was a 57 year old male with suppurative pulmonary disease, hemoptysis, and expectoration of hydatid elements. A palpable splenic tumor was also noted. Treatment consisted of a thoracotomy, resection of the involved pulmonary segment, suture of the diaphragm, and marsupialization of the splenic cyst through the posterior abdominal wall. The thoracic wound healed primarily and the cystic cavity gradually decreased in size. Six months after surgery the patient appears to be in excellent general health; he has no drainage and, aside from some pleural adhesions, a chest film shows that his condition is essentially normal. He has returned to work.

The surgical technique is discussed, particularly the propriety of not doing a splenectomy which, they believed, would have added considerable risk.

—*Nicholas Wetzel, M.D.*

MISCELLANEOUS

Retroperitoneal Tumors (Contributo allo studio dei tumori nello spazio retroperitoneale). GIUSEPPE ANGRISANI. *Rass. iternaz. clin. ter.*, 1956, 36: 445.

THE AUTHOR gives the case report of a 42 year old woman who was found to have a retroperitoneal tumor. X-ray studies, including pneumoperitoneum, revealed the mass to be in the right pararenal area. At operation the tumor was found to involve the right kidney, which was atrophic. The mass was encapsulated and readily dissected free from the adjacent tissue. The pathological report was malignant retroperitoneal mesenchymoma (lipoblastoma). The postoperative course was uneventful and a 13 month follow-up showed no evidence of recurrence.

The author discusses the subject of retroperitoneal tumors, and also presents the classification made by Swan and Roche in 1948.

—*Lucian J. Fronduti, M.D.*

GYNECOLOGY

UTERUS

A Clinical Investigation Into Uterine Prolapse with Stress Incontinence; Treatment by Modified Manchester Colporrhaphy. K. VERNON BAILEY. *J. Obst. Gyn. Brit. Empire*, 1956, 63: 663.

STRESS INCONTINENCE is a clinical entity which sometimes requires special operative treatment. All such cases need special investigation. One-third of all patients with uterine prolapse will complain of these symptoms. Of these about one-third will give positive clinical tests and show negative results to investigations for other causes. The condition being discussed should be studied by means of cystograms.

The Manchester colporrhaphy alone is suitable only for patients with a normal type of cystogram.

When the cystogram shows an impaired or lost P.V.VL angle with a well supported or straight urethra, or a grossly rotational descending urethra the Manchester colporrhaphy is not suitable. A modified Manchester colporrhaphy is described. Both clinical and roentgenographic studies will demonstrate the soundness of the author's technical approach to this condition. —*John R. Wolff, M.D.*

Endometrial Suction Biopsy—a New Method. GERALD C. KOHL and CHARLES P. LARSON. *Obst. Gyn.*, 1956, 8: 408.

ENDOMETRIAL SUCTION BIOPSY is a useful screening procedure for the detection of endometrial cancer and for studying cell cytology in cases of infertility. This study is concerned only with the detection of endometrial carcinoma. A negative endometrial suction biopsy does not necessarily rule out cancer. The same holds true in the cytologic study of cervical or vaginal vault aspirate for the detection of cervical cancer. It is generally recognized that the cytologic detection of endometrial cancer with vaginal and cervical aspirate is highly inaccurate.

A biopsy showing tumor is always confirmed by the study of curretted material before treatment is instituted. With the curette one may better detect the location and extent of a cancer, the presence of adenomatous hyperplasia, and anomalies of the uterine cavity. It is probably more accurate for the diagnosis of cancer. Nevertheless, curettage entails more risk, anesthesia, hospitalization, and greatly added expense, and for these reasons is not an ideal screening procedure. Endometrial suction biopsy, on the other hand, will occasionally reveal cancer inacessible to the curette because of the tumor's position behind a submucous fibroid or other deformity of the uterine cavity. Not infrequently one encounters a senile virgin with an atrophic vagina, uterus, and cervix with marked stenosis of the vaginal vault and cervical canal in whom dilatation and curettage would be difficult even under anesthesia. Endometrial suction biopsies are readily obtained from such patients.

The instrument to obtain the biopsy consists of a 9 inch hollow silver cannula with a blunt tip at one end and a syringe connection at the other. Being silver, this needle is malleable into any desired curve. Over the blunt tip of the cannula a section of polyethylene tubing No. 240 is threaded. The tubing should be about 4 to 5 inches long allowing 1 to 2.5 inches of tubing to project beyond the end of the cannula. Like the bristle of a brush, the shorter the projection the stiffer it becomes and the scraping action is increased.

The distal portion of the needle and the tubing are then curved like a uterine sound so as to pass through the cervical canal and into the uterine cavity with ease. The tip of the instrument can be guided, like a uterine sound, to follow the curve of the uterine cavity in whatever direction it may lie. The tubing is cut squarely across with no additional side openings, since better suction is obtained with but a single opening. The tubing is inexpensive and after use can be discarded. This instrument plus a 20 c.c. syringe and the usual vaginal examination equipment is all that is required for taking the endometrial suction biopsy.

By the use of this technique carcinoma of the endometrium will seldom be missed. However, a negative biopsy does not rule out cancer and the patient is kept under observation. Abundant material for examination is obtained by this method. In only one patient was it necessary to repeat the biopsy because of inadequate material for study. In this patient the endometrium was very atrophic, but adequate material was obtained for diagnostic purposes on the second attempt. One early cancer of the corpus was diagnosed among 52 women studied. Symptoms resulting from the procedure have been remarkably few and mild. A few patients complained of uterine cramping and lower abdominal discomfort during the procedure. These symptoms rapidly subside and the patient leaves the office in no discomfort. Occasionally there is mild bleeding. No alarming bleeding or other complications have occurred as a result of this biopsy procedure. —*Charles Baron, M.D.*

A Rational Approach to the Management of Atypical Lesions of the Cervix. MICHAEL J. JORDAN, GENEVIEVE M. BADER, and EMERSON DAY. *Am. J. Obst.*, 1956, 72: 725.

THE AUTHORS discuss at length the problem of carcinoma in situ, or, as they term it, incipient carcinoma, in regard to diagnosis and prognosis. They discuss the differences of opinion regarding what they call unequivocal carcinoma and the major and minor atypical lesions. They believe the high incidence of carcinomas is out of proportion to the number of invasive carcinomas which are reported and treated, and suggest one of three conclusions:

1. If carcinoma in situ is a precursor to invasive carcinoma, more invasive carcinomas should be seen.

2. If we are not finding enough invasive carcinomas perhaps it is because carcinoma in situ is a reversible lesion.

3. Perhaps the diagnosis of carcinoma in situ is being made too frequently. The authors tend to believe this to be true.

They report 55 cases of carcinoma in situ observed at the Strang Clinic of Memorial Center between 1941 and 1950. These cases ran the gamut of therapy from none at all to radical surgery. The authors discovered the following disturbing factors: in some cases there was failure to confirm the lesion in the surgical specimen; in others unnecessarily radical surgery was done; and in still others a high incidence of complications was observed following radical surgery.

They set up a special study to answer the following questions:

1. Is carcinoma in situ preinvasive carcinoma?
2. If so, how long will it remain preinvasive?
3. Are there different grades of preinvasive carcinoma?
4. Is this lesion the precursor of all invasive carcinoma?
5. Are these changes reversible?
6. Is there any relationship between this lesion and chronic infection?

They studied 136 patients from the point of view of age, religion, race, marital status, parity, menopausal status, and clinical appearance of the cervix.

In the clinic any atypical finding was referred to the special study group for intensive workup, including careful gynecological history, repeat vaginal smears, hanging-drop examination for Trichomonas, iodine staining (modified Schiller test), four-point cervical biopsy, endocervical biopsy if the smear showed predominantly an endocervical atypia, and bimanual and rectovaginal examination.

They report their findings and group the cases on the basis of a pathological evaluation from a minor atypia to unequivocal carcinoma in situ. They discuss management, admit that the problem needs further study, and hope for other study groups of this kind to be formed elsewhere. —*Byford F. Heskett, M.D.*

The Histogenesis of Uterine Myomas. LENNART ZETTERGREN. *Acta obst. gyn. scand.*, 1956, 35: 366.

DURING THE LATTER PART of the nineteenth century three main theories of the histogenesis of uterine myomas were prominent. The first was that the tumors arise from mature muscle cells of the uterus, the second that they are derived from cytogenic tissue forming the muscle and connective tissues of the uterus, and the third that they originate in intrauterine vessels. In the early twentieth century Robert Meyer seemed to demonstrate that the most common origin was from immature muscle cells often in small bundles near the large uterine blood vessels. During recent years Schwarz and Wissner (1949) stated, after thorough study, that myomas commonly arise from the muscular walls of arteries and veins.

The author presents a case of multiple fibromyomas which sheds some further light on the histogenesis of uterine myomas. The tumors reported were numerous and small. In addition, the bundles of uterine muscle were separated from the vessels in the cord which bridged the space between a necrotic myoma and unaltered myometrium. This evidence supports Robert Meyer's theory that myomas do not spring from the muscular walls of intrauterine vessels but from uterine muscle cells situated in the immediate neighborhood of the vessels.

—*Warren R. Lang, M.D.*

The Question of the So-Called Surface Carcinoma of the Portio Uteri (Zur Frage des sog. Oberflaechenkarzinoms der Portio uteri). E. RANDERATH and G. HIERONYMI. *Wien. med. Wschr.*, 1956, 98: 1269.

THE AUTHORS review and discuss carcinoma in situ and arrive at the following conclusions:

They believe, with Hamperl, that there is not sufficient proof so far to consider carcinoma in situ as an early phase of invasive cervical cancer. However, spontaneous regression of "surface cancer," on the other hand, has never been definitely demonstrated. The diagnosis may be most difficult, even in the hands of a well experienced histologist. The following conditions, according to Runge and Stoll, should be present to make a diagnosis:

1. The atypical and immature cells replace the full thickness of the epithelium.
2. The cellular borders are unrecognizable and mitoses are present in all layers.
3. Typical three-group metaphases are demonstrable.
4. There is no stratification in the layers and no normal superficial layer can be recognized.
5. The basal membrane is intact.
6. The neoplastic cells do not change with the menstrual cycle or under the influence of hormone medication.

7.–10. certain biochemical tests are typical.

The authors' material includes 11,000 curettages with 11 cases of carcinoma in situ (0.1 per cent), and 660 cervical biopsies with 13 carcinomas in situ (1.9 per cent). These were seen during a period of 6.5 years since January, 1950. During the same period 250 invasive cancers of the cervix were found, as compared with 24 carcinomas in situ. Not included in this tabulation is the so-called microcarcinoma (Mestwerdt) with characteristic epithelial buds in the subepithelial tissue. Hamperl believes that neither the microcarcinoma nor the surface carcinoma acts like a true cancer.

Half of the 24 cases were of the immature, and 4 were of the mature type according to Limburg's subclassification. In 12 cases the growth was limited to the epithelium, in 8 it had invaded the glands, in 2 it had broken through the basal membrane, and in one case each it involved the endocervical canal and a cervical polyp. Half of the patients had definitive surgery. However, the figures given are too small to evaluate the age incidence, error in diagnosis, and possible prognosis. With cervical biopsies consisting of single bites at 12 o'clock and in the absence of conization procedures, the value of the attempted conclusions is doubtful. In one case an amputation of the portio was done and 4 years later an invasive cancer was found on the hysterectomy specimen.

The connection between pregnancy and carcinoma in situ is also discussed, but with no new contribution to this controversial subject. An interesting speculation of Rössle's is mentioned in this article. This pathologist has made a study of the types of placenta-

tion in various mammals as related to the malignancy of tumors. If the first phase of both is "matricidal" (epithelium growing into epithelium, e.g., carcinoma in situ), then the second phase is "desmocidal" (growth into parenchyma, e.g., local carcinoma without metastases). The last and most destructive phase is "endotheliocidal" (the growth destroying the blood vessel barrier, e.g., metastasizing tumors in the human placenta). This concept may help us in understanding a scale of progressively more malignant behavior of tumor growth which may at some point become irreversible. At this time we do not know on which side of this point carcinoma in situ should be located.

—W. D. Bergman, M.D.

Early Experiences in the Treatment of Carcinoma of the Uterine Cervix with Cobalt^{60} Teletherapy and Intracavitary Radium. JAMES F. NOLAN, JUAN ARAUJO VIDAL, and JOHN H. ANSON. *Am. J. Obst.*, 1956, 72: 789.

THE AUTHORS describe the technique used and results obtained in the treatment of the first 50 patients with carcinoma of the uterine cervix with cobalt teletherapy plus radium placed in the cavity of the uterus at the Los Angeles Tumor Institute.

They give a very thorough discussion of the aims of radiation therapy, the means and methods, and the tolerance to therapy.

In this, their preliminary experience with cobalt teletherapy, they found they could reproduce the desired levels of dosage in the parametrium by the techniques employed. The early results of treatment indicated that the basic theories seem to hold for treatment of patients with less advanced lesions. The upper limits of what they considered optimal dose levels might not be so important in far advanced lesions. Their lack of severe complications made them believe that the dosage levels employed may be increased with safety.

Their experience indicates a slight superiority of this cobalt unit over the 450 kv. x-ray apparatus, which is seemingly related to the more uniform distribution of the radiation throughout the parametrium.

They suggest certain modifications of the basic treatment plan based on their findings. These include only a moderate increase in the parametrial dose by means of external radiation for the early cases, and an appreciable increase in the parametrial dose by means of external radiation with moderate limitation of the intracavitary radiation dose for the advanced cases.

—Byford F. Heskett, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Dysgerminoma of the Ovary. CLINTON NYSTRÖM. *Acta obst. gyn. scand.*, 1956, 35: 385.

DYSGERMINOMA is a rare ovarian tumor resembling testicular seminoma. Its name stresses abnormal germinative development of specific tumor cells. It is the author's opinion that testicular and ovarian tumors do not originate from different dysontogenetic stages during embryonal evolution, but they reproduce these stages through a neoplastic cellular synthesis in the ovum and sperm cell, respectively.

To date there have been approximately 450 cases of dysgerminoma reported in the literature. They comprise about 3 per cent of all primary malignant ovarian tumors, and occur predominantly in young women. Their size varies, and they often are enclosed in a dense capsule. The right ovary is involved more frequently than the left. Microscopically, they present columns or strands, or acini or irregular cell nests of relatively large cells with pale, abundant cytoplasm. The cells usually have two basophilic nuclei. The connective tissue stroma is characteristically infiltrated with lymphocytes. The malignancy of the tumor is no longer disputed.

A case in a 21 year old gravida 1 and para 1 is presented. Laparotomy, done because of a tender abdominal mass, disclosed a large ovarian tumor with a ruptured capsule on the left side. Metastases were present. Bilateral salpingo-oophorectomy was performed; radiotherapy was given later. The patient was alive 5 years after treatment.

—Warren R. Lang, M.D.

EXTERNAL GENITALIA

Vesicovaginal Fistula. HOUSTON S. EVERETT and RICHARD F. MATTINGLY. *Am. J. Obst.*, 1956, 72: 712.

THE AUTHORS present the problem of vesicovaginal fistula from the point of view of etiology, methods of treatment, and results as encountered on the Gynecological Service of the Johns Hopkins Hospital during the 23 years from 1933 to 1955, inclusive.

The 149 cases are divided into four groups: (1) those following surgical procedures—65 cases; (2) those following obstetrical procedures—28 cases; (3) those associated with carcinoma of the cervix and/or irradiation therapy—48 cases; and (4) a small miscellaneous group of 8 cases.

In many of the cases one too many attempts at closure had been made. The authors state that their preceptor believed that at least 6 months should intervene between the inception of the fistula and the attempt at closure to allow traumatized tissue to return to optimum conditions.

Of the 65 cases in the first or surgical group, 46 followed total hysterectomy and 7 followed removal of the cervical stump. Of the 28 cases in the second or obstetrical group, 3 followed cesarean section. In the 48 cases in the third or carcinoma group only 21 of the patients were treated for obvious reasons.

The authors discuss the Latzko procedure and also the relative merit of silver wire sutures.

Of the 149 patients with fistula, 120 were operated upon and 108 were cured. Twenty-seven of the carcinoma group were not subjected to surgery. Three cases of incontinence were relieved by ureterointestinal transplants.

—Byford F. Heskett, M.D.

Vaginitis Emphysematosa. F. ZACHARIAE. *Acta obst. gyn. scand.*, 1956, 35: 393.

TWO CASES of vaginitis emphysematosa in nonpregnant women are reported.

Vaginitis emphysematosa is characterized by the presence of numerous gas-filled cysts in the vaginal connective tissue, many of which are situated just beneath the epithelium.

The disease is benign and disappears without treatment. Therefore, it is of little clinical significance, but

of great interest, since its etiology is still obscure, although the disease has been known for more than 100 years. —*Charles Baron, M.D.*

Five Cases of Basal Cell Carcinoma of the Vulva. JOSEPH WARD. *J. Obst. Gyn. Brit. Empire*, 1956, 63: 697.

FIVE CASES of basal-celled carcinoma of the vulva are described in detail, 77 having been reported previously.

A review of the literature on this tumor in this site is given. The age incidence, etiological factors, diagnosis, relative frequence compared with other vulval tumors, pathogenesis, prognosis, and the treatment were studied and compared with those of like tumors in other sites.

The author recommended biopsy, histologic diagnosis coupled with radical but local excision, and 5 year follow-up study. —*John R. Wolff, M.D.*

MISCELLANEOUS

Estrogenic Control. JOHN H. MULVANY. *J. Obst. Gyn. Brit. Empire*, 1956, 63: 714.

ON THE BASIS of experimental evidence and clinical observation, a means of estrogenic control by the administration of iodine and thyroid is presented, which is of value in the treatment of certain obstetrical and gynecological states with a logical basis for retardation of the endocrine function. Working indirectly through the pituitary gland, the method restricts estrogenic activity by reducing the output of the follicular-stimulating hormone. Study of the process has extended over 7 years. The substance achieved a strong estrogenic-depressant effect.

Estrogenic control is of value in the treatment of functional menorrhagia, primary congestive dysmenorrhea, ovulatory pain and bleeding, premenstrual edema and tension, and habitual abortion. The mechanism of pituitary depression produced by the procedure is also effective in curing the pregnancy headache which arises in the early weeks of gestation in about 2 per cent of the patients, being occasioned by undue swelling and congestion of the gland due to an excessive response to stimulation by chorionic gonadotropin.

Concerning functional menorrhagia, the slowing-up of follicular activity enables the absorption of estrogen accumulated in unruptured follicles, which is responsible for endometrial hyperestrinization. Of 90 cases, only 6 came to operation. A hysterectomy was performed in 3, and the menopause was produced in 16. Two-thirds of the remaining patients were left with a loss less than normal.

In regard to primary congestive dysmenorrhea, relief is probably related to a reduction of the ovarian and uterine congestion secondary to the decrease in follicular activity. The proportion of success is high, about 90 per cent, but correct diagnosis is necessary as the method is valueless for the spasmodic or secondary congestive type of dysmenorrhea.

Ovulatory pain and bleeding also respond satisfactorily, the excessive follicular tension which is the cause of the pain and the estrogen fluctuation which results in bleeding both being sufficiently controlled to stop the symptoms.

Benefit is obtained in premenstrual edema and premenstrual tension, in the former by influencing the mechanism of menstrual electrolytic change linked to estrogen and progesterone function, and in the latter by curbing the cyclical surge of thyrotrophic activity which is linked to the periodic tendency toward sympatheticotonia.

In habitual abortion, estrogenic depression favors the freer operation of the corpus luteum and has produced results equal to the best obtained by other means. Lugol's iodine is given for the treatment of this condition before conception on the assumption that the condition is caused by a primary insufficiency of the corpus luteum resulting from poor trophoblastic development secondary to shallow implantation of the fertilized ovum. This avoids the critical phase preceding the take-over of progesterone function by the placenta which arises from the impact of a rapid drop in output of chorionic gonadotropin on a subnormally functioning corpus luteum whereby the activity of this body falls below the level required to maintain pregnancy. —*Charles Baron, M.D.*

Report of 2,401 Cases of Genital Carcinoma; 1935-1950. (Bericht ueber 2,401 Genitalkarzinome 1935-1950). H. RUNGE and H. ZEITZ. *Geburtsh & Frauenh.*, 1956, 16: 875.

DURING THE YEARS 1935 to 1950 the University Women's Clinic in Heidelberg, Germany, of which the senior author is the director, treated 2,401 cases of genital cancer in the female with the following localizations and results:

Site	*Number of cases*	*% of total*	*Five year cure*
Collum	1,527	63.6	698 =45.7%
Corpus	512	21.3	313 =61.1%
Ovary	194	8.1	46 =23.7%
Vulva and urethra	84	3.5	36 =42.8%
Vagina	81	3.4	27 =33.3%
Tube	3	0.1	—
Total	2,401	100.0	—

This impressive collection of cases comprises only those patients who received all treatment in that clinic. The ratio of collum carcinoma to corpus carcinoma was 3.4 to 1.

Only 94 of 1,527 collum carcinomas were adenocarcinomas, the rest were squamous-cell carcinomas. The classification was made according to the League of Nations' stages prior to any treatment, and the following treatment was employed in the different stages:

Number of cases		*Stage I*	*Stage II*	*Stage III*	*Stage IV*
Total	1,527 =100%	342	743	365	77
Radical surgery	208 = 13.7%	135	64	9	0
Radiation	1,280 = 83.8%	207	679	356	38
Untreated	39 = 2.5%	0	0	0	39

Radical hysterectomy was of the Wertheim type with lymphadenectomy in 138 cases, and of the Schauta-Stoeckel type (vaginal) in 70 cases. The latter approach has not been used since 1947 because of the difficult access to the regional lymph nodes. Ra-

	Wertheim—138 cases	*Schauta—70 cases*	*Total surgery 208 cases*	*Radiation 1,280 cases*
Stage I	94 : 74 =78.7%	41 : 27 =65.9%	135 : 101 =74.8%	207 : 155 =74.9%
Stage II	35 : 19 =54.3%	29 : 16 =55.2%	64 : 35 =54.7%	679 : 325 =47.9%
Stage III	9 : 1 =11.1%	0	9 : 1 =11.1%	356 : 80 =22.5%
Stage IV	0	0	0	38 : 1 = 2.6%
Primary mortality	8 = 5.8%	2 = 2.9%	10 = 4.8%	19 = 1.4%
Fistulas	6 = 4.3%	0	6 = 2.9%	5 = 0.4%

dium treatment was given in 2 or sometimes 3 sessions, 8 to 10 days apart, according to a modified Stockholm technique. The uterus received 30 to 40 mgms. of radium through a 1 mm. platinum filter for 2,400 to 2,600 mgm. hours, and the vagina received 60 mgms. with a 2mm. filter for a total of 4,500 to 4,800 mgm. hours. The total of x-radiation given was 2,400 to 3,000 roentgens.

In the following results, patients were charted as failures of survival if they were lost to follow-up, were alive with proved recurrence, or had died of intercurrent disease. The 5-year survival rate of the Wertheim procedure has risen from 62.7 per cent in the period between 1935 and 1945 to 82.2 per cent (1946 to 1950) in stages I and II, because of the improvement in technique, antibiotics, and bloodbanks; the original primary mortality of 6.5 per cent has dropped to 0.6 per cent in 1955. Of the patients with positive lymph nodes one-fourth were cured (6 of 24). In patients treated by radiation, cure rates were so much worse when elevated temperatures were present that organisms associated with the malignant process now are identified routinely and specifically treated with antibiotics. Recently, over 100 patients in the inoperable stages II and III have been treated with synthetic estrogens, in addition to radium, and have shown marked subjective improvement and no adverse side effects. The following figures are the 5-year survival rates with the different modes of treatment, and the 2 figures are the number of patients treated and the number of patients cured as shown above.

The total survival figures are presented by the following figures in per cent:

	Stage I	*Stage II*	*Stage III*	*Stage IV*	*Total*
Five-year survival	74.9	48.5	22.2	1.3	45.7
Ten-year survival (868 patients)	71.2	37.4	19.8	0	39.6

Of 94 patients with adenocarcinoma (6.2 per cent of the total) 91 were treated and 36.6 per cent survived 5 years. Of the 1,242 patients who received radiation treatment for carcinoma in stages I to III, 250 either had metastases develop or had recurrences; and 35 per cent of these occurred in the pelvic wall, 25 per cent in the upper third of the vagina, and 24 per cent in the parametria. For this reason radioactive cobalt and the pendulum type x-ray tube have recently come into extended use in the cases with parametrial infiltration.

Carcinoma of the corpus uteri was treated with total abdominal or vaginal hysterectomy with bilateral salpingo-oophorectomy and consecutive x-radiation in the majority of cases (51.8 per cent). Radium treatment in amounts of 5,000 to 5,400 mgm. hours was given to patients with inoperable disease, and is not mentioned for preoperative application. The following results were obtained in a total of 512 patients, 16 of whom were not treated because of far advanced disease.

Stage	*Number*	*%*	*5-year survival*	*%*	
I	407	79.5	287	70.5	
II	32	6.3	15	46.8	
III a	32	6.2	9	28.1	27.4%
III b	20	3.9	2	10.0	
IV	21	4.1	0	0	
Total	512	100.0	313	61.1	

The 10 year survival in 236 cases was 51.2 per cent. The primary mortality with abdominal surgery (185 cases) was 4.9 per cent, with vaginal surgery (72 cases) 2.8 per cent, and after radiation (239 cases) 3.4 per cent. Metastases in 123 patients were distributed to the following organs: ovary 37, vagina 30, peritoneum, liver, omentum, and bowel 30, regional lymph nodes 14, and urethra 5.

Carcinoma of the ovary was found in 194 patients, of whom 46 were cured (23.7 per cent). If 52 untreated patients are excluded the cure rate would be 32.4 per cent. Total hysterectomy was possible in 17 patients only (10 cured), and supravaginal uterine amputation, because of extensive disease, was done in 52 cases (15 patients cured). Radium to the stump and roentgen radiation were then applied. When peritoneum or bowel was involved, the uterus was left behind as a radium carrier in 59 patients of whom 21 were cured. Radium and roentgen radiation was started 3 to 6 weeks after surgery. None of the patients with a palliative partial removal of the tumor or other symptomatic treatment survived. The primary operative mortality rate in this group was 9 per cent. Recently radioactive cobalt and gold have been used.

Carcinoma of the vulva was seen in 75 patients with a 5-year cure rate of 40 per cent. Radical vulvectomy with inguinal and femoral lymphadenectomy was considered the treatment of choice, and 18 of 30 patients thus treated were cured. Thirty-seven of these 75 patients had palpable lymph node enlargement, and in 26 of them the nodes were removed and found to contain carcinoma in 19 instances. Of the patients with positive lymph nodes only 1 was cured. If the patients' general condition did not permit radical surgery, the tumor was electrocoagulated and lymphadenectomy done (3 of 13 patients cured). More conservative procedures were employed in very old patients and in those with limited disease. Nine of 26 patients in this group were cured. Postoperative roentgen radiation did not appear to improve overall results.

Urethral carcinoma was seen in 9 patients and all were treated with radium for a cure rate of 66.6 per

cent (6 patients). Intraurethral radium (15 mgms.) was combined with an external plate carrying 20 mgms. of radium and with periurethral radium needles in the presence of extensive involvement. A total of 945 to 2,400 mgm. hours was given with 90 to 120 mgm. hours calculated for every cubic centimeter of radiated tissue. In the majority of cases x-radiation to the inguinal area was also given.

Primary vaginal carcinoma was seen in 81 cases, only 2 of which were adenocarcinomas. The posterior vaginal wall was involved nearly 3 times as often as the anterior wall. The treatment consisted of intravaginal radium treatment with 90 mgms. of radium for a maximum of 3,000 mgms. hours. External radiation was employed 6 weeks later in a technique similar to that of cervical cancer. One patient had a radical Schauta operation and was alive after 5 years. Twenty-seven of the 81 patients survived 5 years for a cure rate of 33.3 per cent.

Three primary carcinomas of the tube were seen, but only 1 patient was operated upon. Two patients died within 5 years, and 1 is alive 10 years after diagnosis.

The authors intend to publish more complete data in the *Deutsche medizinische Wochenschrift*.

—W. D. Bergman, M.D.

Radical Surgery in the Pelvis. GRAHAM GODFREY. *Austral. N. Zealand J. Surg.*, 1956, 26: 1.

THE TENDENCY for cancer of the uterus to remain localized has encouraged attempts to palliate or cure the disease by progressively more extensive surgical procedures. In undertaking such surgery the physician must remember that many pelvic masses or indurations may be inflammatory. If lymphadenectomy is performed it should be done as widely as possible, and if large nodes are noted outside the surgical field, biopsy should be undertaken prior to radical surgical procedures.

There are two basic types of operation. One is the so-called radical hysterectomy which includes removal of a large portion of the vagina, the parametrium, and the lymphatics of the common, external, and internal iliac nodes, the obturator, and the pararectal nodes. The other is the exenteration operation devised by Brunschwig, which may be total or partial, depending on the extent of the lesion. Preparation of the patient is fundamental, as is the selection of the type of anesthesia. Postoperatively, the loss of plasma in the widely denuded area of the pelvis must be considered. The transverse muscle-cutting incision is recommended because of the better exposure obtained.

The various methods of exenteration are discussed. Twenty-one exenterations have been done; of these, 4 were total, 1 was posterior, and the remaining 16 were anterior. Twelve of the patients died; the remainder lived for varying periods of time, the longest survival being 67 months.

The operations are restricted to those patients in considerable distress as a consequence of their malignancy, except in the occasional situation where hope for long survival or even cure might be present. The patient is advised of the extent of the disease and the possibility of operation before it is undertaken.

—James F. Donnelly, M.D.

Urinary Fistulas and Their Management. C. S. RUSSELL. *J. Obst. Gyn. Brit. Empire*, 1956, 63: 481.

THE LITERATURE on urinary fistulas has been reviewed with special reference to the work of Marion Sim and its stimulus to European surgeons.

The changing etiology of these fistulas is described. Whereas in Britain, Europe, and the United States of North America, the majority of fistulas now follow nonobstetrical trauma, formerly, and in medically backward countries still, the majority have followed difficult or neglected labor.

The special methods of examining a patient with suspected fistula are described, and the advantages and disadvantages of the different methods are discussed. The surgical treatment is outlined in detail, and the position of the patient is considered. The possibility of spontaneous closure of the fistula is also given consideration.

The Sims-Emmet operation is recommended for the majority of cases. Flap splitting procedures, postoperative complications, special operations to assist in the restoration of urinary control, and operative repair of the urethra have been described and illustrated. The special problems of the fistula following radium treatment and the treatment of the ureteric fistula are discussed. A series of 50 personal cases is presented.

—John R. Wolff, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Rupture of the Uterus (Rotura uterina). RAFAEL VISO and OSCAR AGÜERO. *Obst. gin. lat. amer.*, 1956, 14: 177.

SEVENTY-ONE UTERINE RUPTURES have occurred among the 74,917 obstetrical cases attended at the Concepción Palacios maternity hospital, Caracas, Venezuela, in the period from September, 1950 to April, 1955. This is a free hospital, accepting obstetrical patients not only from the city of Caracas but also from the surrounding regions. The average age of the patients with uterine rupture was 29 years; 67 (94 per cent) were multiparas and 3 were primiparas; in 1 patient the number of pregnancies was unknown. In 62 instances the pregnancy was in the ninth month, in 4 in the eighth month, in 4 in the seventh month, and in 1 case in the sixth month. In 32 instances the cause was traumatic; in 13 the trauma was an internal version and in 11 a podalic extraction. In 6 cases forceps were used, in 1 case a Braxton-Hicks version was done, and in another manual extraction of the placenta. In 23 instances the rupture was spontaneous. In 6 patients it was due to fetopelvic disproportion, in 2 to hypertonia of the uterus, in 2 to faulty presentation (shoulder and face presentation), in 2 to intravenous injection of dilute pitocin, in 1 to an artificial anus for lymphogranulomatosis, in 1 to hydrocephalus plus the injection of pitocin, and in 1 to a chorioepithelioma. In 8 cases the cause of rupture could not be determined. There were 16 instances of cicatrix of the uterus; in 15 there had been a previous cesarean section and in 1 case a hysterorrhaphy had been performed for uterine perforation. In only 6 of the 15 cases did the rupture occur in the cicatrix of the previous operation.

The statistical finding which is perhaps of the greatest importance is the fact that 55 of these ruptures occurred in the hospital; in 12 the rupture had already taken place when the patient entered the hospital; in 4 the exact time of the accident could not be ascertained.

Treatment in 52 instances consisted of hysterorrhaphy (73.2 per cent); in 16 a hysterectomy was done; in 1 case the uterine defect was not sutured (incomplete rupture); and in 2 cases the death of the mother forestalled any attempt at operation.

The maternal mortality was 11.2 per cent; this represents a notable decrease from the figures of previous years. The fetal mortality was 50.7 per cent.

The large number of ruptures occurring in the hospital itself suggests that the incidence of uterine rupture on the authors' service can be further reduced by study of the causes which produce the accident. Of especial importance are cases in which a previous cesarean section has been done. The question arises as to whether the patient should be sterilized at the time of cesarean section, a question the authors do not attempt to answer. Another question arises as to whether the patient should be sterilized when hysterrhoraphy is done for uterine rupture. The authors believe this should be determined according to the circumstances present in the individual case. There is a real danger of perforation at a subsequent pregnancy. One patient who had not been sterilized had a second rupture of the uterus which had been sutured for rupture.

The cause of rupture in another group of patients was internal version. The authors believe this maneuver should always be preceded by a careful investigation of the conditions present. They are in sympathy with other obstetric services who have shown a tendency to abandon this procedure completely. It is necessary also to consider the dangers inherent in the administration of oxytocics even with the modern techniques which demand dilution of the preparation employed.

Much can be accomplished by a rapid diagnosis, ample blood transfusions, immediate surgery, and protection with antibiotics. Finally, the authors are under the impression that their maternal mortality has been considerably lowered by the technique of hysterorrhaphy. —*John W. Brennan, M.D.*

Trauma and Anoxia (Trauma e anossia). G. TESAURO and V. DANESINO. *Arch. ostet. gin.*, 1956, 61: 157.

THE AUTHORS pay particular attention to the work of Davis, Potter and Bruce at the Chicago Lying-In Hospital, as discussed in their book, *Pregnancy Wastage*. These workers are particularly interested in neonatal mortality, but the authors point out that the real problems are the surviving newborn who later develop phrenasthenia, epilepsy, and Little's disease.

A number of histologic photographic reproductions are appended, showing that many of the lesions exhibited by the newborn infant result from asphyxia rather than from trauma. The delayed manifestation occurs at times in children who have been delivered by cesarean section. They do not ascribe the trauma or the asphyctic manifestations to the cesarean section, but think that these changes arise from lesions which are naturally produced, since such changes occurred in spontaneous labor cases before cesarean section was instituted. They believe that the error in such instances lies in delaying too long before deciding upon the operation.

In a series of 16 roentgenographic reproductions the authors illustrate the so-called pathologic conditions (deformities of the skull, over-riding of the cranial bones at the sutures) that occur after forceps delivery, spontaneous delivery and cesarean section and show that they are much the same in appearance and severity.

The authors do not accept as final the work of De Lee at the Lying-In Hospital as solving the problem of these delayed manifestations of childbirth. They think that his recommendations to carry out an ample episiotomy and deliver the child's head by means of low forceps gently applied (non vi sed arte), may only tend to protect the child's head from birth trauma after the harm has already been done. They

do not think that the scar resulting from a well conducted cesarean section will cause any greater inconvenience than that from an ample episiotomy.

The authors believe the trial of labor should represent merely a means of eliminating unnecessary cesarean sections; that labor should be permitted to proceed only so long as the course of labor shows that spontaneous deliver is possible and that it can be accomplished with relative facility. The trial should be shortened to the minimum time which will determine whether the fetus will be able to overcome the obstacles to birth without excessive trauma.

The authors believe that the preference for delivery of the child by the natural route has in the past been pushed too far. Nor should a preference for cesarean section lead to an abuse of this method of delivery. The correct route to be followed would be an intermediate one, objectively justifiable, and based on rational indications. The indications would be modified from time to time in accordance with the knowledge supplied by physiopathologic studies that are concerned with the consequences of obstetric trauma as reflected by clinical pathologic changes in infancy and by neuropathologic manifestations in the adult.

—John W. Brennan, M.D.

Esophageal Hiatus Hernia in Pregnancy. C. G. Sutherland, J. C. Atkinson, B. G. Brogdon, N. E. Crow, and W. E. Brown. *Obst. Gyn.*, 1956, 8: 261.

The authors studied at random 92 patients who were in the last trimester of pregnancy. The gastrointestinal symptoms of each patient were recorded and tabulated. At the onset of the study, the patients were examined fluoroscopically in erect and recumbent positions and with routine posteroanterior and right anterior oblique studies of the barium-filled stomach.

Hiatus hernia was demonstrated in 20 (22 per cent) of the 92 patients; all hernias were of the sliding type. The ratio of multiparas to primigravidas was about 3 to 1.

The clinical findings varied from none to mild epigastric distress, nausea and vomiting, severe epigastric pain, and hematemesis.

Treatment depends on the severity of symptoms and may vary from frequent small feedings, sedation, and semi-Fowler's position to gastric decompression, fluid and electrolyte replacement, transfusions, and rarely, uterine evacuation. Most of the hernias disappear postpartum. *—Warren R. Lang, M.D.*

Aldosterone Excretion in Normal and Toxemic Pregnancies. J. D. Martin and Ivor H. Mills. *Brit. M. J.*, 1956, 2: 571.

A technique for measuring aldosterone excretion is described. It is a slight modification of the technique of Neher and Wettstein.

Determinations were carried out at various stages throughout pregnancy in 55 normal patients and 20 patients with toxemia. In pregnancy the excretion is often above the upper normal limit. Values tended to be higher later in pregnancy. In toxemia the amounts excreted were within the range for normal pregnancy.

In pregnancy the increased aldosterone excretion may be due to: (1) an alteration of the activity of the center controlling sodium metabolism, so that there is greater aldosterone secretion; (2) the sodium excretory factors being raised and the aldosterone production being increased by the normal homoeostatic mechanism; or (3) the minor role of the pituitary in affecting aldosterone secretion being increased during pregnancy.

The second of these possibilities seems the most probable. Pregnancy is associated with a large increase in progesterone production.

In view of the antagonism between progesterone and adrenal cortical hormones, as regards sodium excretion, the balance between these may be important in toxemia of pregnancy. It is probable that toxemia of pregnancy is not to be explained by the absolute amount of aldosterone secreted but by the summation of the sodium-retaining factors relative to the sodium-excreting factors. It is suggested that the increase in aldosterone secretion in normal pregnancy may be to counteract the sodium-excreting effects of progesterone. Toxemia of pregnancy is probably due to the disturbance of the balance between all the sodium-retaining and all the sodium excreting substances. However there may be more than one cause for toxemia. *—Harry Fields, M.D.*

Hemolytic Streptococci on the Neonatal Umbilicus. W. Kwantes and J. R. E. James. *Brit. M. J.*, 1956, 2: 576.

Outbreaks of hemolytic streptococcal infection continue to occur in maternity units, and their control is still a major issue in obstetrics. It is often difficult to find the source of infection and to determine the precise method of its spread.

In the event of a group A hemolytic streptococcal (streptococcus pyogenes) infection being found the patient is generally removed from the unit. In an attempt to find the source of infection, further bacteriologic investigations are then carried out by taking nose, throat, and vaginal swabs from all the patients, and nose and throat swabs from the medical, nursing, and domestic staff. Particular care is taken as to the completeness of this investigation. The staff and patients are also questioned about the existence of infective lesions. Any carriers of streptococcus pyogenes are excluded from the unit and are not allowed to return until they are bacteriologically negative.

Streptococcus pyogenes is not always found in the swabs from the medical, nursing, or domestic staff. Positive findings have, however, been fairly common in the vaginal and throat swabs of clinically normal patients.

Two outbreaks of hemolytic streptococcal infection occurred recently in Carmarthen and Llanelly. In addition to the routine just described, nose, throat, and umbilical swabs were taken from the infants. A large number of infants were found to be carrying hemolytic streptococci on the umbilicus without showing signs of clinical illness. In several instances this carriage persisted for several weeks, even when the cord had dropped off and the umbilicus looked perfectly clean.

From a careful study of these two outbreaks in different maternity units, the authors concluded that bacteriologic examination of the umbilical swab is

essential in helping to solve some epidemiologic problems in puerperal sepsis. The umbilicus of the newborn infant might provide the means of spread of streptococcal infection to its own mother, to other mothers and infants in the same maternity unit, to midwives, and in domiciliary practice to members of the household. The carriage of streptococcus pyogenes was found to continue up to 8 weeks. A general investigation into the bacteriology of the infant's umbilicus is described. —*Harry Fields, M.D.*

Neonatal Umbilicus as a Source of Streptococcal Infections in a Maternity Unit. JOAN M. BOISSARD and BRUCE ETON. *Brit. M. J.*, 1956, 2: 574.

THE AUTHORS present an account of an outbreak of streptococcal infection in a maternity ward where the immediate source of infection of a case of puerperal sepsis was in the ward nursery.

As soon as the first case of infection was discovered, nose and throat swabs were cultured from the ward staff, and vaginal, nose, and throat swabs from all patients were also studied. None of these showed streptococcus pyogenes. The nursery was then investigated and umbilical swabs were taken from 20 infants still in the nursery. It was noted at the time that none of these showed any abnormalities suggestive of infection. However, 5 infants showed positive umbilical swabs. In addition, streptococcus pyogenes was isolated from the cots and cot blankets of 2 of the infected infants.

Nothing is known about how or when infection entered the nursery, but it seems reasonable to suppose that the most likely route was via an attendant who was in the early stages of an unrecognized infection. It is postulated that infection of the cord probably occurs from the infected hands of an attendant.

The umbilical infection was treated locally with sulfanilamide and systemically with penicillin.

It is important to note that in 5 babies the umbilicus looked normal at a time when it was infected. Obvious clinical changes in the umbilicus are more likely when there is associated infection with other organisms in addition to streptococcus pyogenes. If treatment is required in such cases, it is then advisable to confine it to local applications. One has to keep in mind that the associated organisms may be potent, penicillinase producers, inactivating locally applied penicillin and enabling streptococcus pyogenes to grow and invade the body. In these cases local treatment should be combined with systemic penicillin.

The authors make a special plea for bacteriologic investigation of the nursery whenever a case of streptococcal infection is found in a mother or a member of the staff. —*Harry Fields, M.D.*

Malignant Diseases Associated with Pregnancy. H. CLOSE HESSELTINE and MYRNA F. LOTH. *West. J. Surg.*, 1956, 64: 529.

WHENEVER A MALIGNANT CONDITION is discovered during pregnancy the appropriate treatment should be promptly instituted. The treatment of cervical cancer in early pregnancy may destroy fetal life or leave it with serious damage, but it may also escape major harm. In late pregnancy proper irradiation is less likely to injure the fetus. Therapy for cancer of the breast, colon, and other organs should be instituted at once and completed in accord with the usual management. Risk to the fetus may occur from irradiation, but the best prognosis for the mother requires vigorous steps.

One exception to the use of the accepted therapy is found in the avoidance of radioactive isotopes, as in the treatment of carcinoma of the thyroid gland. Radioactive iodine may cross the placental barrier with a most damaging effect on the fetal thyroid tissue. Other methods of treatment can be used for this carcinoma until the fetus has reached a reasonably favorable viable period, after which the pregnancy should be terminated and isotope therapy instituted.

Symptoms arising during pregnancy must be accurately evaluated. This practice will occasionally reveal carcinomas in early stages, and thereby provide opportunity for earlier institution of therapy and a better outlook for the patient.

Pregnancy has not been shown to have any beneficial effect on any malignant neoplasm. Mammary cancer appears to develop more rapidly and spread earlier in the presence of pregnancy. Cervical carcinoma has been reported to be stimulated by a factor or factors in association with gestation. The authors do not support this view. Carcinoma of nonreproductive structures appears to be independent of and uninfluenced by pregnancy. —*Charles Baron, M.D.*

Carcinoma in Situ and Pregnancy (Carcinoma in situ und Schwangerschaft). ALFRED FOCKEN and GÜNTHER FRANZ. *Geburtsh. & Frauenh.*, 1956, 16: 790.

THE AUTHORS have examined 702 pregnant patients with an average age of 27.2 years, who were admitted for all stages of abortion, for therapeutic interruption, and for ectopic pregnancy. In all cases colposcopy was used either to discover epithelial changes that escaped the naked eye, or to magnify and more distinctly diagnose visible changes. A small "snap" excision of tissue for biopsy, sometimes followed by a larger wedge excision from the cervix was then performed at 12 o'clock about the squamocolumnar junction, unless colposcopy had focused attention on different locations. The junction was properly included in 96.2 per cent of the biopsy material. Atypical epithelium (by colposcope) was present in 25.8 per cent of the cases, and malignant tissue was recognized in 23 patients or 3.27 per cent of the total series. Only three of these lesions had been missed by the colposcope.

The history of these 23 patients is given in exhaustive detail, and it appears that 11 patients are still under observation. Amputation of the portio was done in 3 patients, 2 of whom had no further malignant tissue, while 1 had invasive carcinoma. Simple hysterectomy was performed in 4 patients. Two tumors of the uteri showed no malignancy, 1 a true carcinoma in situ and 1 "invasive superficial carcinoma." A Wertheim hysterectomy in 3 patients revealed invasive cancer in 2 and no malignancy in the third. One patient had radiation treatment without further biopsy or surgery, and in 1 patient the lesion probably was removed by biopsy.

The microscopic slides were studied by several expert histologists and opinions were divided on several cases. It appears that single excision of tissue for biopsies at 12 o'clock could well have been taken from the border of an invasive carcinoma, and cold-knife cone and multiple tissue excisions obviously have not been employed.

The study presented in this paper is based on the belief that it has never been proved conclusively that carcinoma in situ is the early phase of the "cancer disease." The diagnosis of this lesion is strictly microscopic, and histology and morphology at the time of examination do not necessarily give any information as to the biologic behaviour of the lesion in the future. The solution of this problem is made more difficult by the frequent early surgical removal which leaves insufficient material for further understanding of this controversial subject. The authors believe they are entitled to a more conservative attitude for the reason just stated and the following reasons: as American workers (Epperson *et al.*, Nesbitt, Hellman, and Greene) and the group of German researchers around Hamperl have pointed out; carcinoma in situ is diagnosed much more frequently than invasive carcinoma of the cervix. The latent period between these two stages, if they are part of a continuous process, is so long that hurried mutilating operations usually are not justified. Surgical damage, during the childbearing age, may be of a greater magnitude than the potential danger of a consequent invasive cancer.

The authors believe that pregnancy has some connection with carcinoma in situ, and that carcinoma in situ has some connection with invasive carcinoma. They believe that local infections after childbirth may be as significant as gastritis is assumed to be in the etiology of gastric cancer. Obviously carcinoma in situ may become frank carcinoma, but the latent period is so long that definitive treatment can be postponed as long as the patient is under constant supervision. —*W. D. Bergman, M.D.*

Cancer of the Cervix and Pregnancy. Henry C. McDuff, Jr., Wilfred I. Carney, and George W. Waterman. *Obst. Gyn.*, 1956, 8: 196.

Pregnancy as a complication of cervical cancer occurred 16 times in the last 1300 cases (1.23 per cent) at the Rhode Island Hospital. The incidence of cervical cancer in pregnancy is said to be about 0.05 per cent. Multiparity appears to be an etiologic factor which is based on previous sensitization of the cervix by erosions, eversions, lacerations, and cystic changes.

The average age of patients with cervical cancer is 43 years, but where pregnancy is found to coexist the average age is 32 years.

Epidermoid cancer is encountered twenty times more frequently than glandular lesions. Abnormal bleeding occurred in 62.5 per cent of the patients in this series; 25 per cent had no symptoms at all.

The standard schedule of treatment varied with the trimester in which the disease was discovered. Patients in the first trimester were treated by roentgen and radium irradiation and spontaneous abortion; in the second trimester by abdominal hysterotomy, roentgen and radium irradiation; in the third trimester, classical cesarean section, roentgen and radium irradiation; and in the fourth trimester radium was followed by roentgen irradiation. Radical hysterectomy combined with pelvic node dissection can be done instead, in any trimester, provided the case is favorable. Consideration should be given to transperitoneal node dissection following emptying of the uterus in the second and third trimesters. Use of the Porro section is discouraged.

The over-all survival rate for cervical cancer was 46 per cent. In the 16 cases complicated by pregnancy, the survival rate was 56 per cent. The survival figures are directly proportional to the clinical stages of the disease. The authors believe that pregnancy does not hasten the course or increase the severity of the disease.

Prenatal and postnatal smears are recommended, and biopsies should be performed in all suspicious cases, even with coexisting pregnancy. Adequate care of the postpartum cervix should do away with the frequently seen cystic hypertrophied cervix of the multipara. —*Harry Fields, M.D.*

LABOR AND ITS COMPLICATIONS

Maternal and Fetal Mortality in Unattended Delivery. Sol T. DeLee. *Am. J. Obst.*, 1956, 72: 933.

The author studied 2,700 cases of unattended deliveries from the Chicago Maternity Center. An unattended delivery should be differentiated from a precipitate delivery, although the two terms are often used interchangeably. In the current review only pregnancies of 26 weeks or longer were included. Precipitate labor is probably the most frequent cause of unattended delivery. The length of labor, which necessarily had to be based upon the history alone, varied from 4 hours and 20 minutes in the multiparas to 6 hours and 52 minutes in the primiparas.

The maternal complications consisted of a large number of lacerations, predominantly first and second degree, with 5 third degree tears. The incidence of postpartum hemorrhage was 4.5 per cent, a total which is in agreement with the incidence of postpartum hemorrhage in those patients who are attended. Other postpartum complications, such as eclampsia, hypertension, subinvolution, and puerperal infection, corresponded in frequency to those noted in the patient who had adequate care at delivery.

The infant complications directly related to the lack of attendance were more obvious. There were 43 infants who died as a consequence of injuries or accidents which could have been prevented had the patient been attended by a trained person. These consisted of injuries from falls, asphyxia from blood, amniotic fluid, or toilet fluid, failure of delivery of the head in a breech presentation, and cord complications. The stillbirth rate was 4 per cent, or 42.6 per one thousand livebirths. The neonatal mortality was 21 per thousand livebirths, and the perinatal mortality rate of 64 per one thousand was considerably higher than that noted throughout the country.

Although there were no maternal deaths in the series of cases reviewed, the records of maternal deaths of patients registered in the Center over the past 22 years revealed that 4 mothers who were unattended during delivery had lost their lives from massive

hemorrhage. Although the maternal complications appear to be no higher in the unattended delivery, such complications as lacerations, blood loss, uterine atony, shock, fetal asphyxia, and accidents, can be treated promptly in the attended patient with a subsequent reduction in mortality and morbidity of the mothers and infants.

A marked decrease in the maternal and fetal mortality and morbidity rate emphasizes the value of the presence of a physician even when the delivery occurs outside of a hospital. Patients who are educated and trained in a well run prenatal clinic are less likely to have an unattended delivery with its consequent increase of fetal loss. —*James F. Donnelly, M.D.*

NEWBORN

Direct and Indirect Causes of Perinatal Mortality (Unmittelbare und mittelbare Ursachen der perinatalen Sterblichkeit). FRANZ BAUER. *Geburtsh. & Frauenh.*, 1956, 16: 906.

THE PERINATAL MORTALITY up to the tenth day of life in Anglo-American and Scandinavian countries ranges from 3 to 4 per cent, but it has been reported to be as high as from 4.4 to 7.9 per cent in the German Federal Republic. It appears that this rate is somewhat parallel to the incidence of prematurity, which is as high as 10.7 per cent in certain localities.

The author reports on 395 stillbirths and neonatal deaths during the period from August, 1948 to December, 1953, when 8,405 deliveries took place in the Stuttgart Lying-In Hospital. One hundred and seventy-six (2.08 per cent) of the infants were stillborn (absence of respiration even if the heartbeat was present). In the first 10 days of life 196 children (2.33 per cent) died. Perinatal mortality decreased from 4.96 per cent for 1948 to 1950 to 3.96 per cent for 1952 and 1953. The over-all incidence of prematurity (weight of less than 2,500 gm.) remained fairly constant at about 8 per cent during the reporting period, while it contributed 73 and 63 per cent, respectively, to all of the infant deaths. As the mortality of term infants had not changed significantly, the lower perinatal mortality in the second period must be attributed to an increased fetal salvage of premature infants due to the use of incubators, better prenatal care, and other improvements of modern obstetrics and pediatrics.

The following "indirect" causes of death were given for the total of 395 infants: malformations incompatible with life, 57; premature separation of the placenta, 60; premature rupture of the membranes, 54; maternal infections or other disease, 48; toxemia, 27; prolapsed umbilical cord, 19; placenta previa, 17; postmaturity, 8; erythroblastosis, 8; and newborn infections, 7. Malformations occurred in 2.6 per cent of more than 8,000 deliveries, one-fourth of them being fatal. Placenta previa was present in 0.6 per cent of the cases, and one-third of the infants died (10 per cent of the section babies and 64 per cent of the vaginally delivered babies), nearly all of them being premature. Thirty-nine per cent of the infants were lost in pregnancies with premature separation of the placenta, and in this group no increase in fetal salvage can be expected unless the mothers' occupations can be related to placental damage or infarction. Toxemia was followed by fetal death in 11.8 per cent of the cases. In many cases of transverse presentation, borderline cephalopelvic disproportion, and prolonged labor a fetal indication for cesarean section was obviously present retrospectively. The section rate during the reporting period was 2.7 per cent with a maternal mortality of 1.3 per cent and a fetal mortality of 4.8 per cent. Forceps delivery was performed in 2.5 per cent of the cases with a fetal mortality of 5.5 per cent.

In regard to prenatal care it was interesting to note that 9.9 per cent of the mothers were unregistered, but they contributed 39.2 per cent of all the fetal deaths. This must be significant even if allowance is made for the fact that many women were admitted as emergency cases with serious complications after planned home delivery. It is obvious that the general public must be informed of the importance of prenatal care such as is found in the United States. If necessary, women should be attracted to it by an offer of certain social and financial advantages, such as economical distribution of certain foods (in England) and financial assistance during pregnancy (in Finland) which depends on early first prenatal visits.

—*W. D. Bergman, M.D.*

MISCELLANEOUS

The Pitocin Drip. G. W. THEOBALD, H. A. KELSEY, and J. M. B. MUIRHEAD. *J. Obst. Gyn. Brit. Empire*, 1956, 63: 641.

WORLD-WIDE interest has been aroused in the use of the oxytocin intravenous drip in obstetrics since it was first advocated from this hospital in 1948 by the senior author. If it is true that nature has designed oxytocin as the hormone to initiate labor and to effect delivery, it is logical to use it by the drip method in any case in which the obstetrician deems labor justifiable. It would, moreover, follow that inco-ordinate uterine action must be due to activity superimposed on the normal contractions, and that the task of the obstetrician is to eliminate extraneous stimuli, not to withhold oxytocin.

The authors suggest that parturition occurs as the result of a more than a hundredfold increase in the sensitivity of uterine muscle to oxytocin. This is normally effected over a period of days or hours at or about term, but may take place at any time during pregnancy.

Evidence has shown that inco-ordinate uterine action is caused by excessive or irregular activity of the motor fibrils of the autonomic nerves supplying the uterus, and that it can be abolished by deep sedation. It may be necessary to use three separate narcotic drugs to achieve this purpose, for each acts on the central nervous system at a slightly different level.

Irregularity in the fetal heart is due usually to inco-ordinate uterine action which may occur early in labor. Fetal distress may be associated with maternal distress, but maternal distress can occur without any irregularity of the fetal heart. The treatment, unless immediate vaginal delivery is reasonably easy, is deep sedation.

The authors report the use of the triple procedure, which consists of low rupture of the membranes, deep sedation, and the pitocin drip. Each procedure is dependent on the other, and the first two decrease the number of occasions on which the third is necessary.

Of 1,030 patients in whom labor was induced, the pitocin drip was used in 222 of them (22 per cent) and all but 20 were delivered vaginally. Of 600 patients with uterine inertia the pitocin drip was used in 216 (36 per cent), and all but 9 were delivered vaginally. The triple procedure makes it possible to reduce the incidence of cesarean section to the minimum.

The incidence of forceps deliveries was high, particularly in the inertia group. Fourteen of the patients in this group delivered through an incompletely dilated cervix, but all the babies were born alive and went home.

Primigravidity, maternal age, and the weight of the infant (which includes the concept of cephalopelvic disproportion) play an important part, particularly in the inertia group, in determining the mode of delivery.

It is desirable to start the pitocin drip in a dilution of 1 to 10,000 and never in a concentration exceeding 1 to 5,000. On no occasion should a concentration exceeding 1 to 2,500 ever be employed, for the sensitivity of the uterine muscle to oxytocin may increase while the drip is being used.

The authors believe that the hypothalamus is responsible for the onset of labor and parturition, and that noradrenaline causes inco-ordinate uterine activity.

If these precautions are strictly adhered to, the routine use of the pitocin drip is considered safe for all patients who are allowed to go into labor.

—*John R. Wolff, M.D.*

The Value of Intravenous Oxytocin Drip in Obstetric Cases. LARS ENGSTRÖM and LENNART OHLSON. *Acta obst. gyn. scand.*, 1956, 35: 414.

THE AUTHORS report on the use of intravenous pitocin in the induction of labor and in the management of uterine inertia. The average concentration used was 10 I.U. per liter but in some cases it was 20 or 5 I.U.

In 27 cases the aim was to induce labor, and 16 of the 27 attempts were successful. These were either cases of presumed postmaturity or of ruptured membranes without contractions. There were no complications referable to the pitocin drip, nor did the patient experience great discomfort. In some instances the drip was discontinued as soon as regular contractions were established; in others the drip was continued throughout labor.

The intravenous pitocin drip was effective in 39 of 48 cases of uterine inertia, and failed in 2 of 3 cases of secondary inertia. No complications referable to the drip occurred in the children. In 7 patients a transient hypertension was observed and in 1 (a 42 year old primipara) there was an eclamptic convulsion.

The intravenous pitocin drip has the advantages of small dosage, immediate effects, and easy regulation. These properties are especially valuable in primary uterine inertia when there is no disproportion and the fetal head is inaccessible to forceps. Constant supervision is always necessary. —*Warren R. Lang, M.D.*

Contribution to the Study of Fetal Anoxia; Oxygen Content of the Blood in the Umbilical Vessels at the Moment of Birth; Study of the Functional Results of Neonatal Pathology, and of Clinical Data of Pregnancy and Labor; Analysis of 114 Personal Cases (Contribution à l'étude de l'anoxie foetale; dosages d'oxygène dans le sang des vaisseaux ombilicaux, au moment de la naissance; etude des résultats en fonction de la pathologie néo-natale, et des particularités cliniques de la grossesse et de l'accouchement; analyse de 114 cas personnels). PAUL PIRAUX. *Bull. Soc. Roy. belg. gyn. obst.*, 1956, 26: 104.

IN THIS SERIES, chosen at random, obstetrical pathology of grave nature forms only a small part of the whole. The blood determinations were made by the micro-method of Roughton-Scholander. The average readings were as follows: oxygen capacity of the fetal blood, 22.2 volume per cent; oxygen content of blood of the umbilical vein, 11.7 volume per cent; oxygen saturation of blood of the umbilical vein, 52.8 per cent; oxygen content of blood from the umbilical artery, 4.9 per cent; and oxygen saturation of blood from the umbilical artery, 22.5 per cent.

There was a statistically valid correlation evident between the reading of the oxygen saturation of the blood of the umbilical vein and the clinical status of the infant at the moment of birth; in general, the oxygen readings decreased in value as the clinical condition of the child deteriorated.

In the hypermature infant an increased oxygen capacity was noted. In instances of prolonged pregnancy there was frequently a decreased content of oxygen in the blood of the umbilical vein, while oxygenation of the fetal tissues appeared to be perfectly maintained.

No correlation could be determined between the oxygen capacity of the maternal blood and that of the fetus. It would appear that at times some form of strangulation of the cord was responsible for the low oxygen saturation readings of its blood. Low oxygen saturation values of the umbilical venous blood are at times observed after a clinically normal delivery of the child. Hypo-oxygenation under apparently clinically normal conditions has also been observed during the intravenous drip administration of extract of the posterior lobe of the hypophysis.

—*John W. Brennan, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

The Surgical Anatomy of the Suprarenal Glands; Suprarenal and Perirenal Veins (Anatomia chirurgica delle ghiandole surrenali; vene surrenali e perisurrenali). R. WEISZ and B. TORCHIANA. *L'ateneo parmense*, 1956, 27: 380.

TWENTY-ONE CADAVERS were studied by means of roentgenograms and dissection. Twelve of the bodies were male and 9 female; the age at time of death varied from 18 to 72 years.

The suprarenal glands were removed within a block of tissue comprising the diaphragm and the retroperitoneal fatty tissues with the viscera contained therein, the large vessels being sectioned at the level of the inferior pole of the kidney below, and at a finger's breadth above the diaphragm. This block of tissue contained the liver, stomach, duodenum, and pancreas. The liver was then removed, and the suprahepatic vein was ligated. A cannula was then placed in the distal termination of the vena cava and the remaining venous system of the tissue block was injected with a suspension of minium in gelatin. After the venous injection the block of tissue was hardened in formalin and the venous dissection carried out under guidance of the roentgenogram. The original text is documented with roentgenograms, semischematic drawings, and photographs of the dissected preparations.

The authors studied particularly the suprarenal veins and the differences between the right and left sides. On the basis of the anatomical findings encountered in these 21 cadavers and their study of the literature, including the report of Anson *et al.*, they arrived at a number of anatomical and anatomosurgical conclusions.

The authors find that the right suprarenal vein constantly terminates in the inferior vena cava, and the left suprarenal vein in the left renal vein; the left suprarenal vein is much longer on the average than the right. On the right side the suprarenal vein receives in its extraglandular course only a few small superficial suprarenal veins; on the left side it receives also veins from the surrounding structures—the inferior phrenic vein from the lymph nodes and nerve ganglia nearby, veins from the perisuprarenal and perirenal adipose tissue, and occasionally the accessory internal genital vein.

There seems to be no close connection between the arteries supplying the suprarenal glands and the suprarenal veins. The arteries to the gland come from three sources—the inferior phrenic arteries, the aorta and the renal arteries.

From a surgical standpoint the emergence of the left suprarenal vein from the lower anterior surface of the gland and its course anteriorly downward to the left renal vein explain the relative ease with which the left suprarenal vein may be approached transperitoneally from in front and ligated preliminary to the suprarenalectomy, and the preference of the surgeon for removal of the left gland where free choice is afforded. The course of the left suprarenal vein also shows the ease with which it may be used for the purpose of phlebography of the left suprarenal gland. Such studies are now in progress on the authors' service.

The short course of the right suprarenal vein to its embouchure on the posterior surface of the inferior vena cava, and the possibility of the presence of two right suprarenal veins explain the difficulty of approaching and ligating this vessel from in front, especially in the presence of retrohepatic and retrocaval extensions of the gland itself.

The superficial veins of both these glands are of tiny caliber and are of merely secondary surgical importance. Since they are regularly accompanied by their corresponding arterial twigs, they are best considered in connection with these arteries and with the nerve fibers supplying the gland. The course and the anastomoses of these vessels intraglandularly with the corresponding posterior suprarenal veins indicate the possibility of a by-pass for the circulation in instances of occlusion of the anterior suprarenal vessels and of other branches above and below this region.

—*John W. Brennan, M.D.*

Varices of the Upper Urinary Tract and Their Relationship to Portal Hypertension. JESSE G. KESHIN and ARNOLD JOFFE. *J. Urol.*, Balt., 1956, 76: 350.

THE AUTHORS present the report of a case of varicocele of the left kidney in a patient who was suspected of having cirrhosis of the liver; they ascribe the varices to portal hypertension. The patient, a 39 year old woman, complained of severe pain over the left flank. Urologic investigation disclosed left renal calculi and filling defects involving the entire renal pelvis. At the time of left nephrectomy, large dilated veins encompassing the pelvis of the kidney and the ureter were noted. The filling defects noted by urographic studies were due to the varicosities.

The authors cite support for their belief that, in the presence of portal hypertension, potential embryologic channels connected with the kidney open up to form the tortuous natural shunts between the portal and renal systems. This explanation is offered as the explanation for the varices noted in the case which they report. —*Laurence F. Greene, M.D.*

Leukoplakia of the Renal Pelvis and the Bladder. B. S. ABESHOUSE and L. H. TANKIN. *J. Urol.*, Balt., 1956, 76: 330.

THE AUTHORS present a brief review of cases of leukoplakia of the renal pelvis and bladder. Approximately 100 cases have been reported. Involvement of the bladder by this lesion is 3 times as frequent as involvement of the renal pelvis and about 20 times as frequent as involvement of the ureter. Leukoplakia of the bladder is most commonly observed in women. The etiology of this condition has not been established, but the following theories have been proposed: infec-

tion, irritation, dietary deficiency (vitamin A), embryologic defects, and hormonal imbalance. The essential pathologic change is replacement of the normal transitional epithelium by a cornified squamous epithelium. On cystoscopic examination one finds areas of whitish gray or pearl-like plaques.

The diagnosis of leukoplakia of the renal pelvis is extremely difficult, and only 3 cases have been correctly diagnosed preoperatively. However, flakes of gritty tissue in the urine are pathognomonic of the lesion, as is the mottled appearance of the pelvis and calyces on retrograde pyelography.

The therapy for leukoplakia of the renal pelvis is nephrectomy, because of the likelihood of malignant change. In cases of bilateral renal disease vigorous treatment of the infection is advised. The treatment of leukoplakia of the bladder is varied and consists of treatment of the infection, both locally and systemically, high vitamin A diet, fulguration, and the administration of cortisone and ACTH.

The authors report a single case of leukoplakia of the renal pelvis and leukoplakia of the bladder. The treatment consisted of partial nephrectomy and eventual total cystectomy in the former instance and ureterosigmoidostomy in the latter.

—Laurence F. Greene, M.D.

Benign Tumors of the Ureter; Primary and Benign Fibromatous Neoformations of the Inferior Extremity of the Ureter, Prolapsing into the Bladder (I tumori benigni dell'uretere; neoformazione fibromatosa, primitiva e benigna dell'estremo inferiore dell'uretere, procidento in vescica). ENRICO SANSEVERINO. *Gior. ital. chir.*, 1956, 12: 313.

THE AUTHOR'S PATIENT was a 39 year old married woman, who had had 5 pregnancies at term and no abortions. For the past two years she had been complaining of intermittent pains in the right lumbar region with radiation to the right side of the abdomen and the right inguinal region. Recently the pains had been increasing in severity, simulating ureteral colic, and were accompanied by pollakiuria. These attacks were related to the menstrual period; a few days before the period a dull pain would start, and during the period would become a colic of medium intensity. At times there was a mild strangury.

Cystoscopy disclosed a long, slender, more or less translucent structure protruding from the right ureteral orifice. It was freely mobile; it advanced into the bladder lumen with each peristaltic contraction of the ureter and partially retracted with ureteral diastole.

Cystostomy confirmed the cystoscopic findings. The ureter was isolated extravesically, an incision was made made around the ureter and the ureter opened longitudinally. The pedicle of the tumor was extremely slender and was implanted about 8 cm. above the ureteral orifice. The ureter was sectioned about 1 cm. above the implantation of the tumor and the stump of the ureter implanted into the bladder in the right posterolateral quadrant, about 4 cm. from the trigone.

Ten months later the patient returned with symptoms of cystitis, and a small stone was removed from the bladder. The neostomy was somewhat dilated, but there were no signs of urinary reflux. The patient was discharged as cured.

Histologic examination disclosed the presence of a simple benign fibromatous polyp of the ureter. Despite the assertion in the literature that malignant conditions often give the histopathologic appearance of a benign tumor the conservative therapy employed in this instance afforded optimal results.

—John W. Brennan, M.D.

BLADDER, URETHRA, AND PENIS

The Present Position of Radical Cystectomy in the Surgical Management of Carcinoma of the Urinary Bladder. VICTOR F. MARSHALL and WILLET F. WHITMORE, JR. *J. Urol.*, Balt., 1956, 76: 387.

THE AUTHORS present a review of the statistics of 100 patients with carcinoma of the bladder who were subjected to radical cystectomy or pelvic exenteration 4 years or more prior to their study.

Radical cystectomy consisted of total removal of the bladder and pelvic fascia, fat, and peritoneum, together with the satellite lymph nodes at least up to the bifurcation of the common iliac arteries. The organs adjacent to the bladder were routinely removed (prostate, vesicles, uterus, tubes, and upper half of the vagina). In pelvic exenteration the rectum and its immediately surrounding tissues were removed. The authors studied the survival rates of their patients in order to determine whether any group of patients is particularly suitable for radical cystectomy.

They concluded that the following combination of circumstances indicates the desirability of radical cystectomy:

1. The cancer has extended through the muscle layer, but cannot be demonstrated to have metastasized even by laparotomy and nodal dissection. Radical cystectomy performed on patients who have metastasis to more than one or two pelvic nodes has yielded extremely poor survival rates and unimpressive palliation at a great price.

2. At least part of the neoplasm is located in the basal or rectal half of the bladder. A select group of patients in whom the vesical neoplasm involves the upper portions of the bladder may be treated equally well by segmental resection.

3. The patient appears to have a life expectancy of 4 years or more if the cancer were not present.

4. Adequate facilities are available.

Laurence F. Greene, M.D.

GENITAL ORGANS

Studies on the Prostate with Radioactive Phosphorus (Untersuchungen mit radioaktivem Phosphor an der Prostata). D. ZOEDLER, H. ERNST, and H. LAUX. *Zschr. Urol.*, 1956, 49: 462.

THE AUTHORS' MATERIAL was divided into 3 groups. The first group, of 3 subjects had, as nearly as could be determined, normal prostates; the second group, of 10 subjects, presented benign prostatic hypertrophy, and the third group, of 8 subjects, presented untreated prostatic carcinoma. Four of the last group were then included in a series of 8 subjects who were finally tested following hormone treatment of the cancerous condition.

The technique of the test consisted of the injection of a solution of 0.1 millicuries of radioactive P^{32} in physiologic saline solution, which was made into the cubital vein and followed at half-minute intervals, for a total of 7 minutes, by readings of the radioactivity with a Geiger-Mueller microcounter (Friesecke and Hoeffner, Nr. FHZ 19) applied per rectum to the prostate gland. The advantage of these relatively early readings lay in the fact that they were concluded before the excretion of phosphorus into the large bowel had time to vitiate the results.

The figures obtained with the counter were then plotted on graphs. With the exception of a portion of the curves for patients with cancer (solid or scirrhous) and those with treated cancers, all of the curves showed a sudden initial rise in radiation count (blood phosphorus) followed by a falling off of the count (rapid removal of the injected phosphorus by the blood stream), and, finally, a gradual rise in the graphic curve (absorption by the prostate of the radioactive phosphorus). The rise in the radiation curve was markedly higher in the cases of prostatic hypertrophy and of adenomatous prostatic cancer.

The average values of these tests are finally presented in a common graphic presentation of all these groups to show the significance of this series of studies at a single glance (FIG. 1).

The authors believe that these results will introduce a means of attack on a number of unsolved problems related to the pathology of the prostate gland. For instance, the unimportant rises in radiation activity with this method in patients subjected to hormone treatment of carcinoma of the prostate gland, and the absence of the initial rise, or "blood wave," suggest that the efficacy of the hormone treatment indicates an attack on the blood supply to this gland, perhaps centrally provoked, and that the test itself will be of decisive assistance in determining the form of hormone treatment to be applied and its efficacy. Certainly the findings here portrayed favor the theory of increased blood supply to the organ as an etiologic factor in the development of benign prostatic hypertrophy. —*John W. Brennan, M.D.*

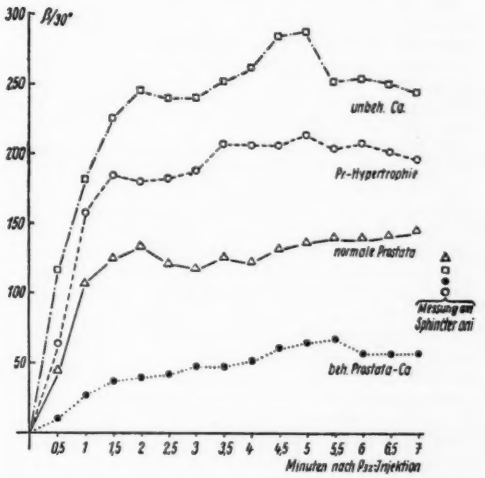


FIG. 1 (Zoedler). Curve showing the significance of studies on the prostate gland with radioactive phosphorus: unbeh Ca. = untreated carcinoma; Pr.-Hypertrophie = prostatic hypertrophy; normale Prostate = normal prostate; beh. Prostata-Ca = treated prostatic carcinoma; Messung am Sphincter ani = measurements at the sphincter ani; and Minuten nach P^{32}-Injektion = minutes after P^{32}-injection.

The Abortive Treatment of Prostatic Hypertrophy (Tratamiento abortivo de la hipertrofia prostatica). S. GIL VERNET. *Urologia*, Treviso, 1956, 23: 233.

THE PROPHYLACTIC treatment of prostatic hypertrophy, as developed by the author, consists of giving large doses of estrogens, combined with electrocoagulation of the posterior urethra. This treatment should be instituted early while the urethroscope shows only a slight bulging into the lumen of the vesicourethral orifice, indicating the beginning of a middle lobe hypertrophy, and slight bulging from the side walls of the posterior urethra indicating the beginning of lateral lobe hypertrophy. At this time the only symptoms are pollakiuria and strangury. As a rule these symptoms appear before the age of 50 and in the not yet old patients of 50 to 60 years.

The estrogen treatment should precede coagulation and should be administered more or less continuously following the coagulation to forestall recurrences. The later course of the condition should be followed by means of control examinations.

The anterior wall of the urethra is never involved in the process and should not be coagulated. The coagulation of the posterior and lateral walls of the urethra should extend from just distal to the internal urethral orifice to a point a short distance above the veru montanum. As much of the internal sphincter as is involved in the swelling process should be destroyed.

After a palpable enlargement of the prostate has developed prophylactic treatment is no longer indicated.

The author believes the blood estrogens represent the causal factor in prostatic hypertrophy, but that they must act on susceptible tissue. The tissue most susceptible to the hormonal stimulus is the cranial and periurethral portions of the prostate gland. With this destroyed the tendency to development of prostatic adenoma is arrested. —*John W. Brennan, M.D.*

Cytologic Diagnosis of Carcinoma of the Prostate (Zur Zytodiagnostik des Prostatakarzinoms). E. KRÖNKE, K. ADERHOLD, and W. BAUMANN. *Zschr. Urol.*, 1956, 49: 449.

IN 30 CASES OF TUMOR of the prostate diagnostic puncture was done by the authors according to the method of Wildegans and the cytologic findings checked against the operative tissue specimen in 29. In 25 cases (83 per cent) the diagnostic puncture and the operative specimen were in agreement and in the remaining 4 cases a malignant tumor was suspected. In only 1 of these was the diagnosis confirmed at operation. In the individual who was not subjected to operative removal of the gland the subsequent clinical course confirmed the puncture diagnosis of a benign prostatic hypertrophy.

In the histologic studies of the puncture specimens staining was not done; the specimen was examined under the phase-contrast microscope.

In evaluating the puncture specimens the criteria used were those given by Aderhold and Siering (*Deut. Zschr. Chir.*, 1953, 275: 257; *Internat. Abstr. Surg.*, 1954, 98: 520).

The five cytoplasmatic criteria were: (1) irregularities of cell size (anisocytosis), (2) cellular polymorphism, (3) inconstancy and changeability of the cytoplasm, (4) an increased number of mitochondria, and (5) vacuolation and inclusion bodies. The six karyologic criteria were: (1) displacement of the nucleoplasma size relationship in favor of the nucleus, (2) differences in sizes of the nuclei (anisonucleosis), (3) nuclear polymorphism with disturbed karyokinesis, (4) thickening of the nuclear membrane, (5) increase or decrease of the optical density of the nucleus, and (6) increase in size and in number of the nucleoli.

The authors found that puncture makes it possible to procure cellular complexes which suggest a more certain diagnostic conclusion than do the desquamated single cell images encountered in the cytologic examination of the expressed secretions. The presence of any one of the listed criteria does not have definite value; it is their presence in combination which affords a degree of certainty. The authors believe that the puncture method is valuable in providing diagnostic material. Although negative findings do not exclude the presence of malignant change the method may be regarded as a worthwhile supplement of other methods of examination. —*John W. Brennan, M.D.*

The Treatment of Malignant Testicular Tumors at the Radiumhemmet in Stockholm (Die Behandlung maligner Testistumoren am Radiumhemmet, Stockholm). G. NOTTER. *Acta radiol.*, Stockh. 1956, 45: 483.

TESTICULAR TUMORS are highly malignant and the mortality rate in patients with these tumors ranges from 30 to 100 per cent. Many of these tumors are radiosensitive and their postoperative radiation presents a number of problems. This report deals with 250 testicular tumors in 247 patients. Of this number 33 were treated during the years between 1951 and 1954 and therefore are excluded from the 5 year survival statistics. The average age at which seminoma of the testis was encountered was 40.8 years as compared with an age of 34 for the other tumors.

The treatment of 214 patients between 1921 and 1950 revealed the following percentile distribution of testicular growths: 50 per cent had seminoma, 18.2 per cent embryonal carcinoma, 3.8 per cent adult teratoma, 27.6 per cent teratocarcinoma, and 04. per cent had mesonephric carcinoma.

Early diagnosis is imperative especially in the cases of seminoma. Five year cures can be achieved in 87.5 per cent of the patients who have no clinical evidence of metastases. If a patient survives the first 4 years after the removal of a seminoma or carcinoma of the testis, his chances for survival from then on are excellent. In 14 per cent of the patients the discovery of the testicular tumor was preceded by trauma, and in 12.1 per cent (30 patients) the tumor developed in a cryptorchid. Gynecomastia is 4 times more frequent in carcinoma than in seminoma of the testis. Eighty of the 247 patients (32.5 per cent) had obvious metastases when first seen. The metastases were located along the routes of lymphatic drainage from the testis. A metastatic tumor may differ in its histologic structures from that of the mother tumor. Thus, in one patient an adult teratoma of the testis gave rise to chorionepithelioma metastases.

Today the treatment of choice for seminoma is ablation of the testis with its vas deferens and vessels from the level of internal inguinal ring downward in the inguinal canal, and postoperative radiation. Carcinomas and chorionepitheliomas may be treated similarly. Radical excision of the inguinal, iliac, and para-aortic lymph nodes may be done, but the tissues which are deprived of their lymphatic supply may be more sensitive to massive postoperative radiation. The radical excision of lymph nodes improves the statistics in cases of chorionepithelioma. Lewis' results from the radical operation were somewhat better than the results of simple orchiectomy only in those patients who had embryonal carcinoma. Ninety-seven per cent of the author's patients were treated by simple ablation of the testis and postoperative radiation which included the area of the para-aortic lymph nodes from the bifurcation of the aorta to the diaphragm.

As a rule, a radiation dose of 1,500 roentgens is sufficient for seminoma, whereas in carcinoma 2,500 to 3,000 roentgens may be necessary. The sensitivity of the tumor corresponds to the differentiation of the cells. The author has avoided the use of 5,000 roentgens for chorionepithelioma as advocated by Lewis, and in this manner has prevented perforation of the stomach and the bowel. During radiation, the abdomen from the inguinal canal up to the diaphragm and a strip 5 centimeters beyond the midline should be exposed in order to include the contralateral anastomotic lymph nodes. If the tumor infiltrates the scrotum, this structure and the inguinal region must be radiated as well. One cannot assume that the diaphragm will prevent the spread of metastases to the mediastinal regions. Each patient, therefore, should be treated on an individual basis.

In 75 per cent of the patients with seminoma, an elevated excretion of follicular stimulating hormone (FSH) was found in the urine. If elevation of chorionic gonadotropin is present, the seminoma is most likely a mixed tumor. In general, an elevation of the chorionic gonadotropin in the urine indicates a poor prognosis. Good prognostic signs are absence of metastases when the patient is first seen, absence of infiltration of the tumor in the tissues beyond the testis, normal chorionic gonadotropin excretion in the urine, normal blood sedimentation rates, and a good general condition of the patient. —*S. Richard Muellner, M.D.*

Transposition of the Penis and Scrotum. ISABELLA FORSHALL and P. P. RICKHAM. *Brit. J. Urol.*, 1956, 28: 250.

THE AUTHORS report the ninth case of transposition of the penis and scrotum, the second to be operated on, and the first in which an associated hypospadias was also repaired. The scrotum of the patient, an 18 month old boy, was bifid and contained two fully descended testes of normal size. The penis was not visible anteriorly, but a small penis in extreme chordee could be

uncovered by elevating the scrotum and pulling it forward. A small, well developed glans and foreskin, and hypospadiac opening were present.

During the first operation the two corpora cavernosa were dissected out, the fibrous bands which held the corpora in chordee were divided, and the dissection was carried back to the origin of the corpora from the ischial rami. The urethral opening was pushed backward by this dissection and a perineal hypospadias was produced. The dorsal aspect of the corpora cavernosa was dissected free, an incision was made in the midline between the two scrotal sacs, and the penis was brought forward through this cleft. The scrotal skin flaps were sutured so as to obliterate the scrotal cleft and to cover the shaft of the penis.

Fifteen months later a Denis Browne repair of hypospadias was performed. Following healing, however, the penis retracted and it was necessary to cover the shaft of the penis with a full thickness skin graft. Convalescence was complicated by prolonged edema of the foreskin and a vesical calculus. These complications responded to treatment and the final result was excellent.

—Laurence F. Greene, M.D.

MISCELLANEOUS

Fluorine in Urinary Tract Calculi. JOHN R. HERMAN. *Proc. Soc. Exp. Biol.*, N. Y., 1956, 91: 189.

IN A SEARCH for the cause of calculogenesis, any new factors might cast an important light.

Ten calculi from various portions of the genitourinary tract were analyzed and then studied for fluorine content. When calcium contents were high, fluorine contents were also high.

No conclusions were drawn except that fluorine was found in high concentration in 8 of 10 calculi analyzed.

The Surgical Spread of Cancer in Urology. PETER BOREHAM. *Brit. J. Urol.*, 1956, 28: 163.

THE AUTHOR discusses 47 cases of probable implantation metastases from carcinoma of the urinary tract. Eighteen of these had been reported previously. He does not believe that implantation occurs on intact epithelial surfaces.

Transitional cell tumors shed malignant cells and clumps of cells in some profusion, and therefore implantation can readily occur if there has been instrumentation or surgery.

The cases reported consisted of bladder carcinomas. Six recurred in the urethra and 5 in the prostatic cavity. After prostatectomy was performed in the presence of bladder carcinoma, there were 15 recurrences in the operative scars.

In order to prevent these recurrences, the author suggests that extreme gentleness be exercised during instrumentation, that bladder carcinomas be brought under control before prostatectomy is done, and that in all cases in which the bladder is to be opened, irrigation be done with a solution that will destroy free cells and superficial tumor cells. The bladder should be irrigated and emptied, and the cystostomy opening draped separately. Use of all of these techniques will help to decrease implantation metastasis.

—John R. Herman, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Nonosteogenic Fibroma of Bone. RAPHAEL R. GOLDENBERG. *Bull. Hosp. Joint Dis.*, N. Y., 1956, 17: 230.

THE AUTHOR'S investigation was based upon 14 cases of nonosteogenic fibroma of bone. A review of the literature was made and excellent illustrations were made of the roentgenograms in characteristic cases.

The periosteum covering the lesion shows little or no thickening except in those instances in which reabsorption of the cortex has produced a cortical defect, or at the site of a pathologic fracture which is undergoing repair. In the former (cortical defect) the periosteum is thickened, and its fibrous tissue extends into and is continuous with the lesion. The gross appearance of the cortex of the affected portion of the shaft will vary with the age and with the activity of the lesion. The involved cortex may be found to be eroded and thinned in some areas and considerably thickened in other locations.

The pathologic studies by Jaffe and Lichtenstein furthered the recognition of nonosteogenic fibroma of bone and emphasized the histologic pattern of whorling bundles of spindle cells, interspersed with small multinucleated giant cells, and the consistent absence of bone formation.

Generally the lesion does not invade the entire diameter of the bone, but when narrow tubular bones (ulna and fibula) are involved the enlarging tumor may occupy the total width of the shaft, thus making the differential diagnosis between nonosteogenic fibroma, bone cyst, fibrous dysplasia, and giant-cell tumor difficult.

Despite the tendency of the lesion to expand and produce bulging of the cortical wall the cortex remains intact. In a pathologic fracture the involved portion of the cortex becomes thickened by new bone apposition. Since some of the reported cases showed multiple lesions, the author suggests routine tubular bone examinations.

The gross and microscopic appearance of nonosteogenic fibroma of bone is essentially the same whether it has been removed from a fibrous cortical defect or from an enlarging lesional area.

The clinical course indicates that in many patients the lesion may be asymptomatic and disappear spontaneously. In other instances the lesional area may persist and enlarge sufficiently to produce pain, swelling, and local tenderness.

The enlarging lesion produced by proliferative activity may grow to a tumorous size, invade the marrow cavity, and on occasion result in a pathologic fracture. These characteristics suggest that nonosteogenic fibroma of bone must be regarded as a benign tumor.

The clinical features of this condition indicate that the great majority of patients with nonosteogenic fibroma of bone are usually older children or adolescents. The occurrence of the lesion is almost equally divided between male and female. The condition is usually excentrically situated in the metaphysial region of a long weight-bearing bone, not far from the epiphysial cartilage. The tumor has been commonly found in the femur, tibia, and fibula. Less frequently the ulna, humerus, and radius have been implicated by the lesion.

Since the lesion develops slowly and frequently disappears spontaneously there may be no clinical signs or symptoms. Pain associated with swelling in the contiguous joint may be the presenting symptoms. In the long bones complaints of pain are, as a rule, a recent development despite the fact that the tumor may have been present for several months. Occasionally the patient is unaware of any disturbance until local trauma is followed by pain, tenderness, and swelling. Routine roentgenographic examination may reveal a pathologic fracture.

—*C. Fred Goeringer, M.D.*

Benign Osteoblastoma. HENRY L. JAFFE. *Bull. Hosp. Joint Dis.*, N. Y., 1956, 17: 141.

THE NAME "benign osteoblastoma" is applied to a peculiar, rather vascular, osteoid and bone-forming benign tumor of the bone, which is characterized cytologically by the abundant presence of osteoblasts. The benign osteoblastoma is a rather uncommon lesion. While it does affect the limb bones, it seems to have a predilection for the vertebral column.

On three occasions the author has observed the lesion in the sacral part of the column, and in 1 of these patients the tumor was found to be about 7 centimeters in its greatest diameter. Next to the vertebral column, the most common location is a short tubular bone of a hand or foot. Occasionally, the lesion is observed in some other bone site, i.e., a long tubular bone, a rib, a scapula, or an innominate bone.

The variations in histologic detail between one lesion and another, and between various parts of the same lesion reflect variations in the evolutionary sequences within the lesions. Always, the basic tissue consists of a loosely fibrillar and highly vascular matrix or substratum rich in osteoblasts.

In any event, what is characteristic of the benign osteoblastoma histologically is the fact that the lesional tissue is exceedingly rich in osteoblasts. Through the mediacy of the osteoblasts, large amounts of osteoid tissue are formed, and this tissue eventually becomes converted into primitive bone, and/or becomes heavily calcified in some places.

In the differential diagnosis there can be no doubt that the histologic tissue pattern of the benign osteoblastoma bears a certain similarity to that of the osteoid-osteoma. Indeed, it is solely on this histologic basis that Dahlin and John decided to designate as "giant osteoid-osteoma" the lesion denoted here as "benign osteoblastoma."

Though the histologic tissue patterns of benign osteoblastoma and osteoid-osteoma mimic each other in a general way, the number of osteoblasts is much

greater in the former. On the clinical side, the benign osteoblastoma does not tend to produce the pain pattern so characteristic of osteoid-osteoma. The benign osteoblastoma is consistently a larger lesion than the osteoid-osteoma, and the latter does not tend to exceed 1 centimeter in it greatest diameter, no matter how long it may have been present.

Histologically, osteogenic sarcoma may be confused with benign osteoblastoma because of the presence of the great number of osteoblasts in the osteoblastogenic substratum of the lesional tissue. To a greater extent it may be due to the fact that, in some tissue fields osteogenesis has been proceeding rapidly and large sheets of osteoid have been laid down. However, careful scrutiny of the tissue section will make it plain that the stromal cells are not large, plump, sarcomatous connective tissue cells; mitoses are rare; sarcoma giant cells are absent; tumor cartilage is not being formed anywhere; and the cells enmeshed in the osteoid matrix are all relatively small.

The likelihood of mistaking a benign osteoblastoma for a giant cell tumor is no longer great. When it does happen, it occurs because undue diagnostic emphasis is placed on the scattered multinuclear giant cells (osteoclasts) which are regularly present in the benign osteoblastoma. As to sex incidence, there is some indication that females may be somewhat predilected. As to age incidence, most of the patients are between 10 and 25 years old, but an occasional one is a young child or a middle-aged adult.

When the lesion is in some part of the vertebral column the complaints (usually of some months' duration) of pain, or aching somewhere in the back, usually become overshadowed by neurologic difficulties. Specifically, a lesion localized to some part of the thoracic vertebra is very likely to give rise to weakness of the lower limbs, paresthesia, or ever paraplegia because of the pressure upon the spinal cord. The complaints of patients with a lesion in some part of the lumbar vertebra are likely to be dominated eventually by pains radiating down the legs, associated with a good deal of spasm of the lumbar part of the column. Complaints associated with a lesion in the sacrum also are likely to be dominated by the effects of pressure on the local nerves.

The complaints caused by a lesion in a long or short tubular bone are usually of only a few months' standing and consist mainly of some dull aching pain. If the bone affected is involved in weight bearing, the patient may limp.

There is another distinctive feature about the roentgenographic picture of a benign osteoblastoma: a small lesion may be no more than 2 centimeters in its greatest dimension, while a large one may measure as much as 7 to 10 centimeters.

—*C. Fred Goeringer, M.D.*

Benign Osteoblastoma; a Category of Osteoid and Bone Forming Tumors Other Than Classical Osteoid Osteoma, Which May be Mistaken for Giant Cell Tumor or Osteogenic Sarcoma. LOUIS LICHTENSTEIN. *Cancer*, Philadelphia, 1956, 9: 1044.

THE AUTHOR believes that it is time to delineate more clearly the pathologic character and the proper treatment of certain benign bone tumors of osteoblastic derivation, other than osteoid osteoma and osteoma. Eleven such tumors have been encountered in long bones, the vertebral column, and other sites. This group includes those previously called "osteogenic fibroma" by the author, as well as others referred to in his classification of primary bone tumors as "other osteoid tissue-forming tumors."

Clinical study showed that 7 of the 11 patients were children or teenagers. There was no special predilection for either sex. The majority of the tumors were located either in long bones or in the vertebral column. Pain, often insidious in onset, and a palpable tender swelling were the common clinical manifestations. The duration of symptoms varied in length from a few months to 2 years. Lesions in the neural arches of the vertebrae result in symptoms and signs of compression of the spinal cord. The roentgenogram shows a well circumscribed lesion, at times delimited by a sclerotized margin; it may be radiolucent or exhibit soft radiopaque mottling.

The gross pathologic appearance is that of a richly vascular, gray-brown or reddish-brown gritty tissue. The basic microscopic picture is that of a well vascularized osteoblastic connective tissue stroma, in which osteoid and new bone are deposited in a rather orderly trabecular pattern. There are variations from case to case, especially in the extent of the calcification of the osteoid deposits. The relative cellularity also varies. Multinuclear macrophages (giant cells) may be especially prominent and may cause some to mistake the lesion for giant cell tumor. The lesion must be differentiated from osteoid osteoma, giant cell tumor, and osteogenic sarcoma.

The treatment is surgical and conservative in type. Thorough curettement and packing with bone chips is usually sufficient. When the disease is located in the vertebrae all tissue pressing upon the cord must be removed as well as the local bony lesion. The overall results have been good; 9 of the 11 patients have had excellent results. One patient had a recurrence that was successfully treated again in the same manner. In only 1 patient with recurrence was there pathologic suggestion of malignancy and this patient will require long observation to be certain.

—*Donald C. Geist, M.D.*

Giant Cell Tumor of Bone. JOHN J. MORTON. *Cancer*, Phila., 1956, 9: 1012.

FROM THE discussion presented in this article, there is conclusive evidence that giant cell tumor, per se, is a frank tumor. Its biologic behavior may be benign, recurrent, or may even become malignant in 15 to 30 per cent.

By way of definition, the author postulates a typical giant cell tumor as being expansile, pulsating, aneurysmal (growth), and absorptive in character, involving tubular bones and flat bones. The bones particularly involved are: the mandible, ribs, pelvis, patella, os calcis, vertebra, sacrum, and metatarsal and metacarpal bones, respectively.

Diagnostic criteria must depend upon roentgenologic studies, needle or trocar aspiration, biopsy, history, and valid clinical evaluation of the patient. By and large, the microscopic studies are indeed of paramount importance to definitely confirm the diag-

nosis. Moreover, a true, benign, giant cell tumor appears in the epiphysis in the majority of patients, and its aggressiveness stops short of the cartilaginous plate.

The treatment is controversial. Braidsford, Ellis, and many other British authorities believe the treatment of choice is roentgenotherapy. Two courses of irradiation via multiple ports are better than one. It is generally agreed that recurrences and the stimulation of aggressiveness with resultant metastasis are more commonly seen when roentgenotherapy is used than when surgical therapy is instituted.

On the other hand, Meyerding and Ghormley of the Mayo Clinic declared that in 101 cases not one patient responded to radiation alone, and hence all of the patients were subjected to surgical intervention, i.e., curettage and filling of the defects with bone chips. The author points out that no preoperative or postoperative roentgenotherapy was given to this large series of patients.

The presentation includes the case reports of 4 patients observed by the author. The first patient was successfully treated by irradiation. The second and third patient were treated by x-ray therapy, but recurrence ensued and was subsequently arrested by the use of bone chips. The fourth case was that of a 17 year old girl with a pelvic mass (4 by 7 centimeters) which projected onto the vaginal outlet. Biopsy disclosed a giant cell tumor. Hemipelvectomy was suggested but was not accepted by the patient. As an alternative, irradiation was given. Its innocuous use resulted in metastasis to the lungs, thyroid, right kidneys, and left adrenal. The patient died 6 years after the initial observation.

This article contains many pertinent x-ray reproductions and microphotographic renditions.

—*Samuel L. Governale, M.D.*

Free Bodies in the Elbow Joint; 4 Cases (Corpi liberi endoarticolari del gomito; 4 casi). A. Mazza and M. Vaccheri. *Policlinico, sez. prat.*, 1956, 63: 561.

The first case reported by the authors was that of a 30 year old agricultural worker who had fallen and injured his right elbow 3 days previously. The joint was somewhat swollen and there was obvious limitation of flexion and extension. There were no painful points and no ecchymoses.

Roentgenologically there was disclosed an irregular shadow of 1 centimeter in diameter in the olecranon fossa and another, smaller shadow in the supratrochlear fossa. In the proximal epiphysis of the ulna a small oval defect, resembling a cyst was visible. The symptoms rapidly regressed and approximately a year later there was only slight limitation of flexion and extension.

The second case was that of a 31 year old male who, while crossing a railroad track, fell and injured his right elbow. There was an extensive ecchymosis on the medial surface of the right elbow joint, pain on pressure over the humeral condyles, and limited extension at the elbow joint. Roentgenography disclosed an osseous body in the olecranon fossa, similar to that in the first case reported.

The third case was that of a 36 year old mechanic who had suffered a contusion of the right elbow about 20 days previously. There was some elevation of temperature, and the patient was hindered in his work. The elbow was still somewhat swollen and there was limitation of flexion and extension.

The roentgenologic examination disclosed the presence of two small, rounded images of osseous density in the coronoid fossa. The joint capsule was opened and the two small masses were removed. They were the size of a cherry seed and covered with cartilage.

The fourth case was that of a 31 year old male with a typical case of articular chondromatosis. The free bodies were located in the olecranon fossa.

In the third case reported the operation did not leave any doubt as to the nature of the condition present—articular chondromatosis—and one assumes the anteriorly placed shadow in the first case was of the same character. With regard to the posteriorly located body in the first case and the free body in the second, the authors prefer to designate them as articular free bodies, without further specifying their nature. They believe that it is erroneous, merely on the evidence of the roentgenogram, to speak of these bodies indiscriminately as instances of osteochondritis dissecans.

—*John W. Brennan, M.D.*

Tuberculous Tenosynovitis of the Hand Treated by Combined Surgery and Chemotherapy. Mac Fellander. *Acta chir. scand.*, 1956, 111: 142.

Following a brief review of the literature, the author presents 19 cases of tuberculous tenosynovitis of the wrist and hand. Eight of the patients had involvement of the flexor tendons at the wrist, 3 of the flexor sheath of only one finger, and 9 of the dorsal tendon sheath at the wrist (one with bilateral involvement). In each instance the diagnosis was substantiated by a histological examination, a guinea pig inoculation, a culture, or a combination of these.

The operations were done in a bloodless field and only the sheath was dissected, the tendons and their gliding tissue being left intact. One gram of streptomycin was applied locally before the wound was closed. Complete immobilization in plaster was maintained for 3 weeks postoperatively. During the course of treatment the patients received daily 1 gram of streptomycin intramuscularly, 10 to 14 grams of para-aminosalicylic acid, and 0.3 to 0.4 gram of isoniazid. Recurrences appeared in 6 cases, all of which healed subsequently, one after chemotherapy alone and 5 after reoperation.

The follow-up study was complete in 14 of the 19 cases. Eleven of the 14 patients were reported to have little or no disturbance of function. In 4 cases, an assay of the exudate removed at surgery demonstrated no streptomycin or very small amounts, while at the same time the streptomycin blood level was about 10 micrograms per milliliter. This raises the question as to whether the chemotherapeutic agents are able to penetrate the intact, involved areas.

—*William B. Stromberg, Jr., M.D.*

Congenital Deformities of the Spine; an Analysis of the Roentgenograms of 700 Children. A. R. Shands, Jr., and Warner D. Bundens. *Bull. Hosp. Joint Dis.*, N. Y., 1956, 17: 110.

Anomalies of the skeletal system have constituted about from 25 to 40 per cent of the total anomalies

TABLE I—STATISTICS ON ALFRED I. DUPONT INSTITUTE PATIENTS WITH ROENTGENOGRAMS OF THE SPINE

	No.	*Per Cent*
1. Total patients examined July 1, 1940 to Nov. 1, 1955	5,320	
2. Total patients with roentgenograms	2,770	52.1
3. Total patients with roentgenograms of the spine	700	13.1
a) Per cent of total patients with roentgenograms		25.3
4. Patients with significant findings in roentgenograms of the spine	337	6.4
a) Per cent of total patients with roentgenograms of the spine		48.3

in most reported series. With 4 million live births in our country each year, and with the average incidence of all congenital anomalies in 10 of the most carefully documented series being 2.5 per cent of live births, there are certainly not less than 25,000 new cases of major congenital deformities each year for the orthopedic surgeons to care for. Another fact of importance to the orthopedic surgeon is that the diminishing incidence of all types of bone infection in crippled children's clinics has caused congenital malformations to become of greater relative importance than ever before.

At the Alfred I. duPont Institute, from 1941 to 1956, there were 2,662 admissions and readmissions, of which 1,266 or 47.2 per cent had congenital malformations.

In 136 children, or about 1 child in every 5 examined, 169 significant congenital abnormalities were found. Spina bifida vera constituted 39.0 per cent of these abnormalities and hemivertebrae 22.5 per cent. Congenital scoliosis constituted one-third of the total 178 spines with scoliosis. There is a distinct predominance of females with hemivertebrae and congenital scoliosis.

The authors have been impressed with the fact that many of the children with a congenital scoliosis and unilateral hemivertebrae will remain well compensated for many of the early years of growth, only to have the condition rapidly degenerate into a severe deformity later on. This appears to be particularly true in the female at about 10 to 12 years of age,

TABLE II—MAJOR TYPES OF SPINE ABNORMALITY

	No.	*% of Total Abnormalities*	*% of 700 Spines Examined*
Congenital abnormality	136	40.0	19.4
Idiopathic scoliosis	71	20.8	10.1
Paralytic scoliosis	33	9.7	4.7
Tuberculosis	31	9.1	4.4
Vertebral epiphysitis (Scheuermann's disease)	30	8.8	4.3
Trauma (disloc. and fract.)	9	2.6	1.3
Miscellaneous*	31	9.0	4.4
	341	100.0	48.6

*Miscellaneous includes abnormalities due to arthritis, laminectomy, osteomyelitis, cord tumor, secondary to chest surgery, etc.

NOTE—One paralytic and 3 idiopathic cases of scoliosis also had congenital anomalies which make the total number of individual patients 337.

TABLE III—TYPES OF CONGENITAL ABNORMALITY

	No.	*Per Cent*
Spina bifida vera	66	39.0
Hemivertebra	38	22.5
Congenital wedging	23	13.7
Congenital fusion	16	9.5
Spina bifida occulta (3 seg.)	8	4.7
Spondylolisthesis	7	4.1
Congenital absence of spine segments	5	2.9
Klippel Feil syndrome	3	1.8
Chondro-osteodystrophy (Morquio's)	3	1.8
	169	100.0

NOTE: Because of multiple abnormalities, total number of patients is 136.

which is the same age period of rapid increase in the curvature as that noted in idiopathic scoliosis.

In the series was a total of 66 patients with spina bifida vera. Approximately 80 per cent had paralysis and sensory loss to some degree. The typical case showed a sensory level at the second, third, and fourth lumbar vertebrae. Forty-three, or 66 per cent, had either a meningocele or myelomeningocele sac when first examined or a scar with a history of removal of a sac many years before. Sixty per cent of these operations had been done within the first 6 weeks of life. It is the authors' distinct impression that these patients may have all lost some function or sensation through this early surgery, which either should have been delayed or should have allowed as little removal of the sac as possible. This impression confirms the observation of Owens.

There was a goup of 5 patients with an absence of a major segment or segments of the lower spinal column. The most unusual of these cases was the one in which there was an absence of the first 3 lumbar vertebrae. No reported case of this kind has been found by the authors in the English medical literature. There have been many reported cases of absence of the sacrum and coccyx associated with the absence of one or more lumbar vertebrae. One of the most recent complete reports was by Katz in 1953; he reviewed 46 cases of absence of the sacrum and coccyx in the literature and added one of his own.

A brief review of the embryology of the spine is given showing that there are many potentials for developmental errors in the formation of the spine.

Excellent illustrations of the various types of spine deformities are included. Also included are the tabular results indicating the major types of spine abnormality and the type of congenital abnormalities.

—*C. Fred Goeringer, M.D.*

Hemangioma Cavernosum of the Tibia (Emangioma cavernoso della tibia). I. F. GOIDANICH and R. VENTURI. *Chir. org. movim.*, 1956, 43: 295.

THE PATIENT was a 29 year old housewife who had had 2 uncomplicated pregnancies and was 3 months gravid with a third. Three years previously the patient noted a tumefaction at the level between the middle and lower thirds of the right tibia. This was painful at night, especially after a day of hard work. It had not changed in size. At examination it was found to be the size of a pigeon egg, roundish, and covered with normal appearing skin.

The roentgenologic examination led to the tentative diagnosis of a Brodie's abscess. The anterior covering of the bone marrow cavity was removed to expose the tumor mass. This was composed of tangled, irregular, old clots containing blood sinuses. These were scraped out and the marrow tissues thoroughly removed with the curette. The operative field was again examined roentgenologically in a search for possible remains of tumor tissue.

The postoperative course was without incident. The operative specimen, consisting of the anterior plate of thickened periosteum, the cortex and marrow, was examined roentgenologically. This disclosed in the region of the lesion a bone defect of ovular shape, 3 by 2 centimeters and subdivided by osseous partitions into 5 or 6 loculi. In places the bony tissue was sclerosed and the cortex was of increased density.

Two months after operation the cast was removed. Roentgenologic examination at this time revealed a defect in the tibia 6 by 3 by 3 centimeters which occupied its medial and anterior portion. There remained some small cavities beneath the main operative defect, but these gave no sign of activity. There was evidence of a tendency to new formation of bone on the base and at the sides of the defect. Three months later another roentgenogram presented much the same findings; the newly formed bone was well on the way to filling completely the operative defect.

Histologic examination of the tumor tissue disclosed a rather dense but otherwise normal appearing collaginous and elastic fiber connective tissue without evidence of atypical nuclei. Blood sinuses were lined with normal appearing endothelial cells and contained large numbers of erythrocytes. The histologic diagnosis was benign hemangioma cavernosum.

This is the seventh instance reported of such involvement of the tibia. It is apparently the first instance in which the close relationship between the tumor tissues and the surrounding bone has been studied, providing evidence that the stroma is derived from the interstitial tissues of the bone itself. This is apparently the first case in which there is reported a difference in temperature of 2 degrees between the two legs, with the higher temperature in the leg with the tumor.

Treatment in the authors' opinion should be curettage of the locus, which is then filled with homoplastic or heteroplastic spongiosa. Under conditions or in locations inadaptable to surgery adequate roentgen irradiation may afford satisfying results.

—*John W. Brennan, M.D.*

Massive Gangrene of the Anteroexternal Muscle Group of the Lower Leg, Resulting from Embolism of the Tibio-Peroneal Trunk (Le sphacèle massif de la loge antéro-externe de la jambe. A propos d'un cas par embolie du tronc bi-tibio-péronier). C. CHIPPAUX, A. CARAYON, and L. CORNET. *Presse méd.*, 1956, 63: 1739.

THE AUTHORS' PATIENT was a Vietnamese solder who had been wounded some 14 hours before admission to the Lanessan Hospital in Hanoi, French Indo-China. His left thigh had been transfixed by a projectile which injured the femoral artery. The involved portion of the artery and accompanying vein was excised and the wound closed. Seven days later fluctuation was noted in the anteroexternal muscle group of the leg. Wide opening and drainage resulted in relief of the symptoms but a month later causalgia-like pains and burning sensations developed. The area was further incised and drained and a placental graft placed into the cavity. The pains were finally relieved by sympathectomy of the second and third lumbar ganglia and an ulcer of the heel also healed, but the wound in the leg remained unhealed and the foot was fixed in a position of equinovarus. Function of the foot was finally restored by a Lambrinudi-Boppe operation (subastragaloid and midtarsal arthrodesis).

An arteriography during the long period of hospitalization showed an absence of the superficial femoral artery from the level of origin of the deep femoral artery to the beginning of the popliteal artery. Neither the peroneal nor the tibial artery could be visualized.

The authors' analysis of the etiology is as follows: embolic obliteration of the tibioperoneal trunk with re-establishment of the blood flow in the posterior tibiae by way of the anastomotic artery of Gambarelli. The anterior tibial and peroneal arteries were not recanalized. —*John W. Brennan, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Direct Approach and Pott's Disease (Abord direct et mal de Pott). P. GÉRARD-MARCHANT. *Presse méd.*, 1956, 64: 1411.

AN EARLY direct approach is not favored by the author. With the modern antibiotics a stabilization of the vertebral tuberculous locus should be attainable in from 3 to 4 months. During this period of stabilization the author applies a posterior bone graft. When the lesion becomes stabilized with a localized area in the bone filled with granulation or fibrous tissue, perhaps unhealthy fibrous tissue containing specific bacteria which are reached only with difficulty by the antibiotics, the surgical indications become definite and even more so when the roentgenogram gives unrefutable evidence of the presence of a sequestrum. Another indication is the presence of a cold abscess which stubbornly resists healing. A relative indication is present when the bone defect threatens the development of a gibbus. Every indication is affected more or less by the susceptibility of the organisms present to the antibiotics available.

Finally there are the painful forms and the forms with nerve involvement which may justify an early intervention, but in which the indications are too indefinite to be discussed at this time. It is more logical to attack surgically a lesion in the adult than in the young child.

When intervention is decided upon one problem remains—the procedure to be used. Theoretically one should remove the diseased tissue completely. The resultant defect should be filled with bone chips or, if the defect would seem to require it, a supporting bone graft. The problem may be difficult since the lesion may have involved both sides of the vertebral column or have extended longitudinally. One is not

certain as to whether drainage should be used; it may depend upon whether the organism is susceptible or resistant to the antibiotics, though some surgeons do not place much dependence on these drugs.

The operation must be carried out under roentgenologic control since the conditions encountered upon exposure of the field of operation frequently do not jibe with the preoperative roentgen findings. The extent of demolition must not be carried too far under the illusion that the entire lesion must be removed at all costs; the more favorable cases may heal without surgery but it is always wise to carry out a posterior graft by Albee's method. —*John W. Brennan, M.D.*

How Should the Condition of Spondylolisthesis Be Treated? (Wie soll man die Spondylolisthese behandeln?) G. HAUBERG and K. SCHLÜTER. *Chirurg*, 1956, 27: 403.

IN THE PERIOD of 5 years (1950 to 1955) 131 patients with spondylolisthesis (89 men and 42 women) were observed on the authors' service. In 3 instances the displacement had occurred between the third and fourth lumbar vertebrae, in 29 instances between the fourth and fifth lumbar, and in 94 instances between the fifth lumbar and the first sacral vertebrae. In 2 instances there was a supernumerary lumbar vertebra with the displacement between the sixth lumbar and the first sacral vertebrae. In 3 instances there was a double spondylolisthetic displacement; in 1 of these the displacements were between the third and fourth and the fourth and fifth lumbar vertebrae, and in 2 between the fourth and fifth lumbar and the fifth lumbar and first sacral vertebrae.

Seventy-six of these patients had adequate treatment for a sufficient length of time and they form the material for this study. Of these 76 patients, 64 were treated conservatively and 12 were operated upon.

In all of these patients attention was focused initially on muscle spasm. Application of heat and a proper position for relaxation of the spasm were adopted. In rare instances recourse was had to injections of novocain-glucose solutions, and in others underwater and other forms of massage were administered.

After the muscular spasm was controlled curative gymnastic exercises were started. Only properly adapted and not too vigorous muscular efforts seemed to bring relief. In most instances the desired results were attained without the wearing of an orthopedic corset.

When the pain apparently was the result of relaxation of the tissues, rather than muscle spasm, maintenance of the resting position by application of a plaster cast proved to be the most successful treatment. In these patients also relief of pain followed hot-air treatments and massage, especially underwater massage. The orthopedic corset was reserved for cases with recurrence of pain that developed after a relatively short time and under slight provocation.

In some instances intervertebral disk pathology may have been a factor in the algetic syndrome. In these cases the previously described treatment did not bring consistent relief from pain; it was secured only by placing them on a firm mattress supported by planks or boards.

Root pains were encountered in 10 per cent of the patients. They were treated according to the principles used for hernias of the intervertebral disks—rest in beds with supported mattresses, extension, vibrations, massage, hot applications and underwater massage. With disappearance of the radicular symptoms further treatments were conducted along the lines described above, and finally with an orthopedic corset. Under this conservative treatment 60 per cent of patients were rendered free of symptoms; 30 per cent received such benefit as to be able to resume their previous avocations, and 10 per cent have not yet received any benefit from treatment.

Twelve of the 131 patients were operated upon. Operative treatment was indicated for the following: (1) youthful individuals in whom symptoms had persisted in spite of treatment, especially treatment with the orthopedic corset; (2) patients with recurring radicular symptoms which defied conservative measures; (3) the rare instances in which a further progress of the spondylolisthetic deformity could be demonstrated.

The ideal operative procedure would be a complete fixation of the contiguous vertebral bodies. An insufficient procedure is a paraspinous fixation by bone transplant of the Hibbs' type that perhaps is associated with an incomplete freshening of the articular surfaces of the smaller interarticular joints. There should also be a fusion of the neighboring vertebral arches by means of multiple, small bone chips, and the cleft formation should be bridged with bone. With these operative methods satisfactory results were obtained in all but one instance. In this case the desire for sick benefits may have influenced the mental attitude of the patient.

The authors have never attempted reposition of the displaced vertebral bodies.

—*John W. Brennan, M.D.*

Skin Arthroplasty of the Hip Joint. K. E. KALLIO. *Ann. chir. gyn. fenn.*, 1956, 45: 181.

THE AUTHOR reports his new method, called skin arthroplasty, in which a fresh autogenous whole-thickness skin graft with fatty tissue is used as interposition material. The operation is based on animal experiments which deal with the fate of the skin graft that is buried in a tissue defect. Specific experiments were performed in which a skin graft was used as interposition material in arthroplasties of the hip joints of cats. It was shown that the interposed skin graft preserves its vitality and develops into new tendon-like connective tissue that acts as an organic layer between joint surfaces and replaces cartilage.

Defects of the abdominal wall and of the Achilles tendon had been replaced by a fresh autogenous whole-thickness skin graft. These experiments showed that when a fresh whole-thickness skin graft is used, the organism destroys or isolates the tissue which is ectodermal in origin and transforms the tissue which develops from the mesoderm into an organic part of itself.

A detailed description of the operative technique is given. The interposition material is obtained from the skin of the abdomen.

Motions of the hip are allowed after 14 days and the patient is discharged 5 to 6 weeks after the operation to continue the gymnastic exercises at home and to walk with the aid of crutches for the first 4 months.

After that the patient uses a walking-stick, but in some cases this may be unnecessary later on.

The skin arthroplasty has several advantages. The operation is most conservative. The length of the femoral neck and head need not be shortened, and since the weight-bearing area of the head can be preserved, the operation need not weaken the mechanical strength of the bone, which renders the bone less liable to wear. Owing to the ideal plasticity of the skin, it is also possible to preserve the shapes of the articular surfaces so that the original adaptation of the head in the acetabulum can be left as such. In case the statics of the joint are correct, the result is a feeling of a natural joint in walking.

No infection or other complications have occurred in the series of 52 consecutive clinical patients. There has been no indication to reopen the joint and, therefore, no possibility of studying the fate of the interposed skin graft in a human arthroplasty.

The results of the 52 skin arthroplasties favorably compare with the author's results on 118 cup or endoprosthesis alloplasties of the hip joint.

—*C. Fred Goeringer, M.D.*

The Principle and Advantage of "Fully Automatic Nailing of the Femoral Neck," as Described by G. Kuntscher (Wesen und Vorteile der vollautomatischen Schenkelhalsnagelung nach G. Kuntscher). R. LEEMANN. *Helvet. chir. acta*, 1956, 23:246.

THE USE of the three-flanged nail for pinning of fractured hips started about 25 years ago and certainly changed the entire aspect of the treatment of fractures of the neck of the femur. In an attempt to shorten the operating time and to allow better immobilization of the fragments, the author found that the operation described by Kuntscher further improved the method of internal fixation. It is very important that an accurate reduction of the fracture be accomplished, and that the leg be kept in internal rotation so that the neck of the femur will lie horizontal to the operating room table.

A large hole (about 0.5 inch) is made in the outer cortex about 4 fingers distal to the greater trochanter, and a Kuntscher nail especially designed for this particular purpose and available in different sizes is introduced manually until it impinges on the inner aspect of the inner cortex. The nail is then allowed to slide upward past the fracture site into the femoral head. If resistance is encountered a mallet is used to push the nail into the femoral head. No guide wire is used and the course of the nail is checked in the operating room by x-ray film. A screw is used to fix the distal end of the nail to the shaft of the femur.

This procedure was followed in 27 cases with a mortality rate of 7.4 per cent. In 1 case the tip of the nail penetrated the neck at its medial aspect; in one the nail entered the acetabulum, and in 2 others a fracture occurred at the level of the shaft of the femur at which site a rather large hole had been drilled in the outer cortex.

The author follows the recommended postoperative care by keeping the patient on bed rest for about 6 weeks; no plaster cast is used. The results obtained with this treatment were very satisfactory.

—*George I. Reiss, M.D.*

Results of Various Operative Methods for Treating Fractures of the Patella (Behandlungsergebnisse verschiedener Operationsmethoden bei Patellafrakturen). J. DETHLOFF. *Acta orthop. scand.*, 1956, 25: 296.

THREE DIFFERENT methods for treating fractures of the patella were studied in the University Orthopedic Clinic at Lund, from 1946 to 1954. There were 70 such fractures during this period, but only 40 of them required surgical attention. Moreover, 7 of the remaining 40 were not included because of pre-existing pathology in the involved joint.

The cases were grouped as follows: group 1, total extirpation (9 cases); group 2, partial extirpation (8 cases); group 3, approximation of fragments (12 cases).

The purpose of the article is to compare the end results of these three methods of treatment with special reference to function and arthritic changes of the knee joint.

Eight of the patients in group 1 had marked comminution of the patella with a separation of 1 to 3 centimeters between fragments. Silk mattress sutures were used to approximate the patellar tendon and the quadriceps in 6 cases. In the remaining 3, a direct suture was not possible. They were brought together in the best possible fashion and attached to the lateral ligaments. The lateral ligaments were sutured with a longitudinal stitch. Motion was started about 30 days postoperatively. Approximately 61 days after starting motion, the knee could be actively flexed to 90 degrees.

In each of the patients in group 2 there was a large, intact fragment of bone estimated to be two-thirds of the patella. The quadriceps mechanism was united to the bone with silk sutures in 7 cases. The remaining fracture was repaired using sutures only in the soft tissues. Postoperative immobilization in a cast averaged 33 days. About 77 days following institution of exercise, the knee could be flexed to 90 degrees. In one patient a manipulation under general anesthesia was required.

The line of fracture was transverse in most of the patients in group 3. Drill holes were made through the fragments, and 9 fractures were repaired with wire, 2 with silk, and 1 with catgut. The average postoperative plaster immobilization was 34 days, and after 77 days of therapy the knee could be actively flexed to 90 degrees.

Functional evaluation was based upon the ability of the patient to step up on an elevation of 20 cm. (+), of 42 cm. (++), and of 60 cm. (+++) without the aid of his hands. First the healthy leg was tested, followed, in turn, by the injured extremity.

Healthy	*Injured*	
+++	++	(diff. of +) slight functional loss
++	++	(diff. of 0) no functional loss
+++	+	(diff. of ++) function clearly diminished

The patients in group 1 had full extension in 7 instances, and one lacked 5 degrees of full extension. The average loss of flexion, as compared to the sound knee, was 16 degrees. Functionally, 7 were equal to the normal side and 2 were slightly diminished.

All the patients in group 2 had full extension. The average loss of flexion was 13 degrees. Six of the patients had no functional loss, and 2 were judged to have slightly diminished function.

All the patients in group 3 also had full extension. In 3 patients the flexion was equal to the normal side, while in the remaining the average loss was 6 degrees. Seven patients had no functional loss, 3 had slightly diminished function, and 2 had clearly diminished function.

In addition to the clinical examination, subjective symptoms were tabulated and evaluated. Symptoms of tiredness, instability, difficulty in climbing stairs, and the necessity of changing occupations were recorded. The results obtained from the follow-up survey were as follows:

Class A. The patients were completely asymptomatic, able to carry on a full work load, and to participate in athletics.

Class B. The patients were able to carry out their regular activity and work load, but complained of tiredness and instability when confronted with strenuous activity.

Class C. The patients were forced to find easier employment because of instability and weakness in the injured knee.

Group 1. Seven of these patients were classified as A and 2 as B. Six of the patients in class A were farmers and performed strenuous work.

Group 2. Seven of the patients were classified as A, and one as B. As in group 1, the patients in class A did relatively hard labor (farmers and foresters).

Group 3. Seven of the patients were classed as A, 3 as B, and 2 as C.

The x-ray findings of the 3 groups were compared with the following results. Examination of the patients in group 1 showed that 7 had periosteal proliferation in the old patellar bed. There was slight evidence of arthritic changes in the tibiofemoral joint. Two patients in group 2 had slight arthritic change in the tibiofemoral joint, but no evidence of change in the patellar-femoral joint. In group 3, there were 2 cases of slight and 2 cases of more pronounced change in the tibiofemoral joint. At the patellar-femoral articulation, 4 patients had slight evidence of arthritis and 3 had more distinct changes.

It is apparent that patients treated with total or partial removal of the fractured patella had the most satisfactory results. The patients who had surgical approximation of the fractured segments showed some good results, yet the only bad results were found within this group. These poor results emphasize the importance of anatomic reduction when the patellar joint surface is involved. It would seem, therefore, more prudent to remove all or part of the fractured bone in borderline cases. —*William B. Stromberg, Jr., M.D.*

FRACTURES AND DISLOCATIONS

The Relation Between Alkaline Serum Phosphatase, Bone Healing, and the Sudeck Syndrome (Beziehungen zwischen alkalischer Serumphosphatase, Knochenbruchheilung und Sudeck Syndrom). R. Dohrmann and H. J. Thieme. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 283: 240.

Fracture healing is to be interpreted as the new formation of bone at the site of a mechanical destruction of the physiologic unity of bone. This process is dependent upon integrated organic and inorganic processes which anatomically and chemically are identical with the processes that occur in growing bone. Of particular importance is the action of alkaline phosphatase. The phosphatases are a group of ferments whose substrates are the phosphoric acid esters. Specific structures are not entirely clear at this time. The phosphatases are in general isodynamic; that is, they work at an optimum *p*H, and, thereby, differ from one another. This has led us to speak of alkaline and acid phosphatases. This article concerns itself with the alkaline phosphomonoesterases of the bone and serum.

In 1923, Robinson first described a bony substance of growing animals which split off phosphate ions from calcium hexosemonophosphates. This alkaline bony phosphatase could only be detected in the skeleton. The opinions about the site of formation of alkaline serum phosphatase are still variable. Osteoblasts, liver, and pancreas have been thought to be the cells which form the alkaline serum phosphatase.

An investigation was made to establish whether, from the behavior of the serum alkaline phosphatase during the course of fracture healing, any conclusions could be reached in regard to the progress of the reparative process. From 1947 to 1952, determination of serum alkaline phosphatase was carried out in 22 patients. Immediately after the fracture determinations were done every week, later at somewhat longer intervals; 30 studies were done on each patient. Some of these went on for more than a year after the fracture. To exclude sources of error, blood was not withdrawn immediately after a meal, when it was rich in carbohydrates, or immediately after a narcotic had been administered. The method of King-Armstrong was used in the determination of the serum alkaline phosphatase. The normal value for adults was found to lie between 4 and 8 King-Armstrong units.

In all patients there was an increase in phosphatase levels in the serum during the course of the fracture healing. In an undisturbed course of fracture healing the maximum values were found between the fifteenth and the thirtieth day. A somewhat regular pattern could be followed when these determinations were plotted on a graph. The phosphatase value falls for the first few days in a gradual decline. After 5 days an increase is observed which reaches its peak between the twentieth and the thirtieth day. The phosphatase level then fluctuates around a value which lies between the normal and the highest level reached until the conclusion of clinical healing. When weight bearing or use of the fractured extremity is allowed there is a renewed increase of the phosphatase level. Any alteration of the position of the fragments, during the healing process, also results in a reaction of the serum phosphatase level.

These studies further show that the clinical repair of the fracture occurs before the return of the serum phosphatase levels to the normal values. Often the levels were still elevated more than a year after the fracture.

During the organization of the fracture hematoma, from the third to fourth day, there is a development of undifferentiated connective tissue which is bound at the fracture site with a gelatinous material that Block has stated is colloidochemical. Later this becomes in-

filtrated with collagenous fibers. After the osteoid zone of trabeculation has been formed the cells of the outer layer are transformed into osteoblasts. A deposition of calcium is demonstrable after the sixth day and before the osteoid trabecular network is completely formed. After several days the serum alkaline phosphatase may increase to many times its original value. After these increased levels begin to decline, the first roentgenologic evidences of calcification are recognizable. In the fourth to the sixth week, changes occur at the fracture site, and the newly formed tissue is transformed into the final callus. After the fracture is clinically healed and subjected to use, there is a functional adaptation of the callus to this mechanical stress. The duration of the healing process varies with the size of the fracture fragments and the site of fracture. All of these processes appear to be dependent upon osteoblastic activity and the alkaline bony phosphatase. The elevated values of alkaline phosphatase in the serum over a period of several months indicate that the phosphatase is also concerned in the reconstructive processes in the final callus. The elevation of enzyme values more than a year after the fracture is an indication that bony reconstruction at the fracture site is not yet complete. By a determination of alkaline serum phosphatase it is possible to determine the course of the reparative processes in the bone after a fracture.

Eight patients with Sudeck's syndrome were studied. No variation from the normal was observed in the alkaline serum phosphatase levels in these patients. It can be stated, therefore, that in Sudeck's bony dystrophy after a fracture the alkaline serum phosphatase levels are lower as a result of the absence of osteoblastic activity. —*Robert D. Larsen, M.D.*

Prognosis in Dislocations of the Shoulder. Carter Redd Rowe. *J. Bone Surg.*, 1956, 38-A: 957.

The author has studied a series of 500 dislocations of the shoulder in patients who were treated over a 20 year period with a mean follow-up period of 5 years. Four hundred of the dislocations were primary and 100 were recurrent. The recurrence rate in the 400 initial dislocations was 38 per cent. The dislocation was anterior in 98 per cent with the subcoracoid position 3 times more frequent than the subglenoid. There was no known trauma in 5 per cent, but this excludes the cases of paralysis. The atraumatic cases showed variations in the shape of the humeral head and the glenoid. In these the recurrence rate was 86 per cent, whereas it was only 55 per cent in the traumatic cases.

The most significant single factor that influences the prognosis in a dislocation of the shoulder is the age of the patient at the time of the initial dislocation. Of the 500 cases, 100 dislocations occurred for the first time between the ages of 10 and 20, and another 100 between the ages of 50 and 60. Eighty-five per cent of the patients with recurrences were under 23 years of age, but only 12 per cent were over 50 years.

Associated fractures of the shoulder girdle occurred in 25 per cent with 15 per cent being of the greater tuberosity. These later cases showed a low incidence of recurrence (7 per cent). The author believes this was due to the increased tissue trauma and the scar formation. Nerve injury occurred in 5 per cent but was permanent in only 1 per cent. The median cord of the brachial plexus was the most commonly involved. The patients who had 3 weeks of immobilization in a sling and swathe had the lowest recurrence rate.

Defects of the humeral head were seen in 40 per cent of the primary dislocations and in 60 per cent of the recurrences. These defects are best seen in axillary and internal rotation x-ray films. Shoulder arthrograms were not employed. Dislocations were twice as common in males.

The Bankhart method of repair was performed in 75 cases with only 1 recurrence, but there was a 50 per cent recurrence rate after 30 Nicola procedures. Following the Bankhart repair 60 per cent of the results were excellent, 20 per cent good, 15 per cent fair, and 5 per cent poor. —*D. Keith McElroy, M.D.*

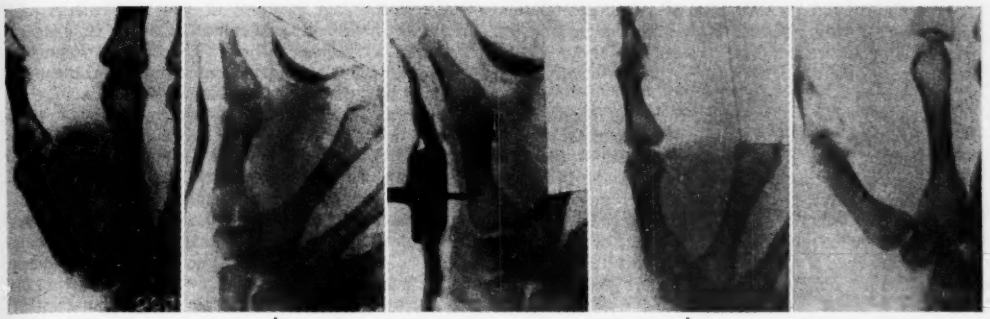
Practical Considerations with Reference to the Treatment of Fractures of the Proximal Extremity of the Radius (Indirizzi nella cura delle fratture dell'estremo prossimale del radio). V. Prignacchi. *Chir. org. movim.*, 1956, 43: 402.

At the Rizzoli Institute of the University of Bologna 139 (6.6 per cent) of 2,104 fractures of the elbow joint were fractures of the upper end of the radius. This fracture occurred in 29 (21 per cent) of the patients between 20 and 30 years of age. There were 49.6 per cent males, and 50.1 per cent females. In 83 (61.7 per cent) the fracture was isolated; in the remaining 56 cases it was associated with other fractures—of the olecranon, coronoid, condyle, epicondyle, trochlea, with supracondyloid fractures and with luxations at the elbow joint. Excluded were simple fractures of the radial head without displacement.

The text is illustrated by roentgenograms of 8 cases and with roentgenograms and photographs showing the late results. In the first of these, that of an 11 year old boy, a closed reduction was done. The result was good; pronosupination was complete and flexion was limited by only 15 degrees. Closed reduction was accomplished in 5 other instances, but the results were not very satisfactory, and the author prefers open reduction with excision of the radial head but not the radical resections recommended by Sever and Carstam in 1925.

In almost all the resected cases the author has been able to obtain a follow-up examination after from 2 to 20 years. The patients examined after a long interval show an increase in physiologic valgus, but this is an esthetic rather than a functional fault. In 41.1 per cent of 21 patients with a more or less extensive resection the ultimate result was excellent, with complete return of function at the elbow joint. In 37.2 per cent of this group the ultimate result was good with limitation of 5 to 10 degrees in flexion and extension. In 11.7 per cent the result was only mediocre; flexion-extension and pronation-supination were reduced approximately one-half. In 9.8 per cent the result was poor, flexion-extension through a range of a few degrees was painful, and pronation-supination was lost.

The author concedes that reduction without resection, even open reduction, should be the objective in the very young child, and a closed reduction may be attempted in any case. In most instances the closed



a b c d e

FIG. 1 (Scarfi). a, Fracture of the Bennet type; b, immobilization in plaster splint; c, pressure applied according to Delitala; d, twenty days from initiation of treatment; e, after 4 months.

reduction will not be satisfactory, or will be completely unsuccessful. In these instances open reduction is indicated, and the procedure of election is removal of the head with careful shaping of the stump of the radius, removal of all intra-articular fragments, and exclusion of the joint cavity by suture of the capsule about the radial stump.

The operation should be performed within the first 24 or 48 hours. Immobilization should not be longer than 12 to 15 days. The cast is then removed and physical therapy begun. —*John W. Brennan, M.D.*

Modifications of the Conventional Treatment of the Bennet-Rolando Fracture (Modificazioni alla abituale tecnica di trattamento delle fratture di Bennet-Rolando). G. SCARFÌ. *Chir. org. movim.* 1956, 43: 492.

THE AUTHOR gives roentgenographic reproductions showing the application of Delitala's pressor in the treatment of Rolando's fracture and of Bennet's fracture. These roentgenograms show practically complete restoration, and the author states that the functional recovery of the thumb and hand in both instances was almost perfect (FIGS. 1 and 2).

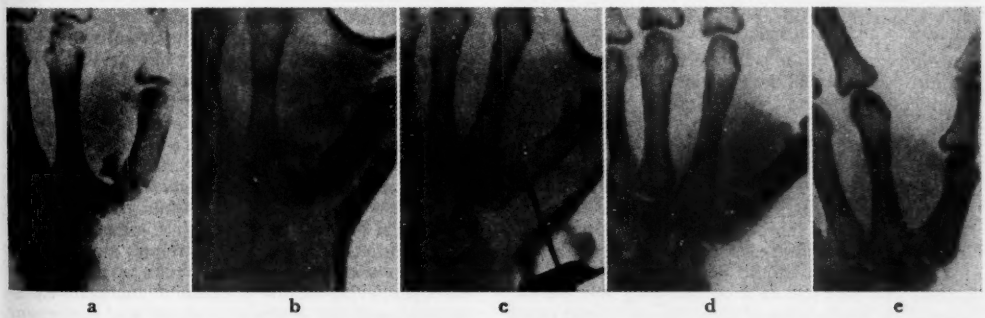
Other methods proposed for the reduction and retention of these fractures of the base of the first metacarpal do not, in the author's opinion, promise satisfactory results, or are cumbersome and perhaps difficult to apply. They may also endanger the functional integrity of the trapeziometacarpal joint.

The author designates the method a bloodless procedure. The lesion is reduced by longitudinal traction with the axis of the thumb in abduction and with digital counterpressure. Traction is applied by means of a cylinder of gauze fixed to the second phalanx of the thumb by adhesive plaster. The pressor of Delitala is applied immediately at the place and in the direction most effective for applying its elastic pressure to the displaced fragments. Pressure is maintained for 20 days and a brief cycle of physical therapy is given.

In the Bennet type of fracture the pressor acts by preventing dislocation; in the Rolando type, in which good reduction by means of external manipulation is not always obtainable, the pressor produces a more complete reduction. —*John W. Brennan, M.D.*

A Study of Acetabular Injuries and Their Treatment (Zur Kenntnis und Therapie der Hueftpfannenverletzungen). J. VOLLMAR and ST. WACHTLER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 283: 208.

INJURIES of the bony pelvis have paralleled the increase in the use of automobiles, both in numbers and in seriousness. Experience has shown that injury of



a b c d e

FIG. 2 (Scarfi). a, Fracture of the Rolando type; b, immobilization in plaster splint; c, reduction by means of the Delitala pressor; d, twenty days after initiation of treatment; e, after 6 months.

the acetabulum, in the presence of a fracture of the pelvis, is easily overlooked. However, the prognosis in a pelvic fracture depends to a great degree upon the integrity of the neighboring joints, expecially the two hip joints.

The most frequent acetabular injury is fracture of the base of the acetabulum. The incidence of acetabular injuries in pelvic fractures lies between 10 and 20 per cent in previously reported series. In the present series, there were 215 fractures in the region of the pelvis. Of these, 59 or 27 per cent occurred with injuries to the acetabulum. X-ray evidence of the fracture was obtained in all cases. There was little difference in the frequency of injury to the right and left half of the pelvis.

Pelvic fractures in the first 10 years of life are very infrequent. Injuries of the acetabulum in this age group were not observed in the present series. This is probably due to the great elasticity and adaptability of the child's pelvis. Pelvic fractures are divided rather equally over the third to the seventh decade. Males in the sixth decade have the highest incidence of concomitant injury to the acetabulum.

One hundred and six of the injuries resulted from traffic accidents, 50 occurred at work, 59 occurred during the course of everyday life, and 3 were due to attempted suicide. In the 50 pelvic fractures which occurred at work 38 per cent of the patients had an associated injury of the acetabulum. This high incidence is due to the fact that many of these were agricultural injuries in which the patient fell from a great height. In the 106 pelvic fractures which were due to traffic accidents there were 21 injuries of the acetabulum. In over half of these the patients were pedestrians who were struck by autos, motorcycles, and streetcars. In the pelvic fractures which were due to accidents of ordinary daily living, there were 19 associated acetabular injuries, and in three-quarters of these there had been a fall from a great height.

The mortality in the 215 cases of pelvic fracture was 10.6 per cent; in the 50 acetabular injuries it was 10.1 per cent. Of the 6 patients with fractures of the acetabulum who died, only 2 of the deaths were attributable to the fractured pelvis. In the other cases the death occurred as a result of associated injuries. Fifty-four per cent of the patients with fractures of the bony pelvis had other severe injuries, such as other fractures, chest or abdominal injuries, or cerebral trauma. Only about one-third of the patients with fatal injuries, in the entire series of 215 pelvic fractures, died as a direct result of the pelvic injury. Causes of death included laceration of the great vessels. The mortality in patients who have a pelvic fracture and no other injury is about the same as the mortality of fractures in general; that is, about 1 per cent. The mortality rate rises rapidly, however, when there is injury to the organs within the pelvis, or when there is an accompanying serious injury of some other part of the body. The mortality then lies between 5.5 and 15 per cent. Cranial injuries are the most common injuries associated with fractures of the pelvis. One-third of the patients who died had an accompanying injury of the cranium. A combination of lower extremity and pelvis injury is more frequent than the combination of upper extremity and pelvis injury.

The protected position of the human hip joint requires the direct application of force in order to produce a fracture of the acetabulum. From the anatomic point of view, acetabular fractures can be divided into the following groups: (1) fractures of the margins of the acetabulum, either as an isolated injury or in combination with other injuries; (2) fractures of the base or articular surface of the acetabulum, with central or posterior dislocation of the femoral head, or without dislocation.

Fractures of the margin of the acetabulum occurred in 14 cases. Fractures of the margin of the acetabulum almost always involve an upper or posterior segment of the acetabular margin. Only in isolated cases are fractures of the anterior and lower margin seen. As an isolated bony injury this fracture is encountered practically only as a lesion accompanying posterior dislocation of the femur. Occasionally fractures of the upper margin of the acetabulum are seen without recognizable dislocation of the head of the femur. In these cases it is assumed that there was a temporary dislocation of the femoral head which has been spontaneously reduced. As the femoral head is dislocated and the ligaments of the hip joint tear away the acetabular margin, a wide separation of the fracture fragments may occur. In most instances, however, after reduction of the dislocation, there is only a minor degree of separation between the fractured acetabular margin and the pelvis, since the neighboring intact portions of the capsule tend to hold the fracture fragments together.

Fractures of the margin of the acetabulum may also accompany fractures of the articular surface. Of 56 fractures of the articular surface of the acetabulum, an associated fracture of the acetabular margin was recognized by means of roentgenography eleven times. The mechanism of injury here is different from that which is seen in posterior dislocation of the hip. As the femoral head is driven into the articular surface of the acetabulum, the head of the femur and the greater trochanter are driven upward against the superior and posterior margins of the acetabulum. When this occurs the fragments of acetabular margin are usually larger than they are when the fracture of the margin is produced by posterior dislocation of the hip. This double acetabular fracture is a prognostically unsatisfactory injury of the hip joint.

The prognosis of acetabular margin fractures is not uniformly satisfactory. Simple posterior dislocation of the hip without acetabular injury results in the appearance of delayed arthritic changes in 15 to 20 per cent of the patients, particularly calcification and aseptic necrosis of the femoral head. An accompanying fracture of the acetabulum increases this percentage 3 to 4 times. Small fragments of acetabular margin do not require special treatment. The best possible reduction of the dislocated hip must be obtained.

It must be recognized that when there is a large fracture of the acetabular margin there is a danger of redislocation of the hip. The extremity must be maintained in traction for 3 weeks in such cases. Only a severe shattering of the acetabular margin with resulting instability of the joint would lead to operative intervention. Other indications for operative intervention would be the presence of fracture fragments

within the hip joint and the occurrence of sciatic nerve injury by a large fragment.

Fractures of the articular surface of the acetabulum were seen in 56 patients. An analysis of the mechanism of injury in these patients allows one to place them in the following etiologic grouping: 38 injuries or 68 per cent resulted from a fall or a blow against the greater trochanger; 4 from a fall on the ischial tuberosity; 4 from a fall or a blow in the long axis of the femur, forcing it against the acetabular surface; 1 from a fall against the posterior pelvis; and 9 from an associated injury of the acetabulum in fractures of the pelvis from various origins.

Approximately two-thirds of all fractures of the articular surface of the acetabulum occur as a result of blows on the greater trochanter. In order to produce this injury there must be first a localized application of the force on the trochanter, and second, a central positioning of the femoral head on the acetabular surface, so that the force is transmitted more or less exclusively along the long axis of the femoral neck. The fact that fractures of the femoral neck and fractures of the anterior portion of the pelvic ring are more common than fractures of the acetabulum indicates that these requirements are not frequently fulfilled. Usually a force applied to the greater trochanter, when the femoral head is in its normal position, is not transmitted against the center of the acetabulum, but is rather transmitted toward the symphysis pubis. This results in a fracture of the horizontal ramus of the pubic bone, which is known as the classical Malgaigne fracture. The femoral head is centrally placed when it is slightly rotated internally, in the mid-position between abduction and adduction, and midway between flexion and extension. In this position, if a force is applied to the greater trochanter and the femoral neck does not break, the force will be transmitted directly to the articular surface of the acetabulum.

Fractures of the acetabulum, produced by a blow upon the greater trochanter when the femoral head is in the central position, can be divided into the following 3 grades:

Grade 1—This fracture of the articular surface of the acetabulum is the most frequent, and is merely a fissure running through the acetabular surface. The femoral head is not injured. In the adult this fracture may also develop into a T or Y form following the old epiphysial lines.

Grade 2—In these fractures there is, in addition to the fracture of the articular surface of the acetabulum, a fracture of the ischium as well. Often as the ischium becomes fractured there will be an associated fracture of the horizontal ramus of the pubis. There were 22 such cases in this series. In 13 patients there was a central dislocation of the femoral head, once a posterior dislocation was encountered. In 8 patients there was no injury of the femoral head; however, there must have been a central dislocation of the femoral head at the moment of impact to account for the fracture of the ischium. If the force which produces this injury is great enough, it will also drive the greater trochanter against the acetabular margin. This contact will result in a fracture of the posterior acetabular margin.

Grade 3—In this fracture of the acetabular surface there is an accompanying injury of both the anterior and the posterior pelvis on the side of the injury. This fracture almost always arises when there is compression of the pelvic ring exactly in the transverse diameter with the simultaneous application of force on both the iliac crest and the greater trochanter. The fractures of the pubis, ilium, and ischium may assume many bizarre forms, depending upon the amount of force applied to the trochanter and iliac crest. Characteristic of these fractures, however, is a shattering of the acetabular surface, which is practically never absent.

In the second etiologic group—acetabular fractures produced by a fall on the ischium—there were 4 cases. These arise through a diagonal compression of the pelvic ring. The entire ischium then tends to rotate toward the mid-line of the body, with resulting fracture lines that pass through the acetabulum above and through the junction of the inferior pubic ramus with the ischium below. In a fracture of this type, one should look for an associated compression fracture of a lumbar vertebra, the same as in fractures of the calcaneus, tibial head, or femoral neck. As a general rule, in all pelvic fractures that occur as a result of falls on the gluteal muscles, roentgenograms of the vertebral column should be taken, since associated compression fractures of the vertebrae are frequently present.

In the third etiologic group—fractures of the acetabulum produced by a force acting in the long axis of the femur—there were 4 cases. As a rule, at the time of injury in these patients, the knee and hip joints are bent at right angles, and the force is applied to the anterior surface of the knee. The flexed position of the hip joint also facilitates the transmission of the force to the posterior margin of the acetabulum. If this area fractures, posterior dislocation of the hip joint is apt to occur. The combination of a fracture of the articular surface of the acetabulum with posterior hip dislocation was described as early as 1935 as a typical automobile injury. This injury is also seen in motorcycle accidents, since the knees commonly encounter the obstacle first. Fractures of the acetabulum from a fall on both feet, with the knee and hip joints extended, is a rarity.

Shattering of the hip joint on its posterior surface, associated with injuries of the femoral head, is a severe complication of the typical acetabular fracture and considerably worsens the prognosis. The basis for the poorer prognosis is that: (1) there is an additional tearing of the posterior capsule, with a tendency to calcification in this region; (2) there is a tendency to the formation of early arthritic joint changes, especially in the region of the fractured acetabular roof; and (3) there is an increase in tendency to the occurrence of aseptic necrosis of the femoral head. If, as occasionally happens, the dislocation of the femoral head is not recognized for several days, the likelihood of aseptic necrosis is increased because of the compression of the vessels in the over-stretched joint capsule and ligamentum teres. The possibility of such an occurrence makes it mandatory to obtain x-ray films of the entire pelvis in every acetabular injury to rule out a simultaneous injury to the femoral head.

The fourth etiologic group of acetabular fractures—those fractures which are produced by the application of a force on the dorsal surface of the pelvic ring—are observed only rarely. This type of injury occurred only once in the present series. The mechanism of injury is described as beginning with a blow on the sacrococcygeal surface which first breaks off the free caudal sacral segment, and drives it into the interior of the pelvis. This results in the relatively common transverse fracture of the sacrum at the level of third sacral foramin. If the force is applied obliquely, such as in a fall, it is directed posteriorly and laterally to the back and outer side of the ilium, and results in a fracture of the cranial portion of the ilium. This fracture has a great similarity to the so-called Duverney fracture. With this type of fracture there usually is no involvement of the acetabulum.

The last etiologic group of acetabular fractures includes those fractures of the acetabulum which were produced at the same time as other pelvic fractures. To be considered in this group are: (a) pubic fractures or fractures of the anterior ring, (b) a double vertical fracture, and (c) fractures of the sacral wing.

In pubic or in double vertical fractures, if the fracture lines are far enough lateral, there is almost always a fracture of the acetabulum in its upper inner quadrant. Since there is usually no severe separation of the acetabular fracture fragments, this injury may be often overlooked. These patients then will be immobilized for too short a time, and after a brief period of walking without difficulty they will begin to experience pain in the hip, particularly after prolonged walking or standing. A new x-ray film will frequently reveal the injury of the acetabulum. In all cases of fractures of the pubis one should search carefully for an accompanying fracture of the acetabulum.

In iliac fractures which are frequently the result of the direct application of force to the crest of the ilium, the fracture line may pass downward into the roof of the acetabulum. Here, again, the prognosis depends upon the recognition of the fracture of the acetabulum and the proper immobilization of the patient for the treatment of this injury.

The multiplicity of methods of treatment of fractures of the acetabulum shows that up until this time there is no method that will give good results uniformly. Westerborn, in a review of over 500 pelvic injuries, found that 51 per cent of those with acetabular fractures were employable at their former work after the fracture healed. If there is a simultaneous central dislocation of the femoral head, this percentage is reduced to 10 per cent. The experience with the present series gives the same results. Forty-one per cent had good or very good results, 33 per cent had reasonable results, and 26 per cent had poor results.

It has not been decided as yet whether operative methods, particularly the hip arthroplasty of Smith-Petersen, will improve the long term results significantly. The poor results in the conservative treatment methods may be the result of incomplete reduction of the acetabular fragments. The pull of the obturator internus muscle posteriorly and medially may be responsible for the persistent displacement of the acetabular fracture fragments. This displacement results in protrusio acetabuli with simple dislocation of the femoral head, or in an incongruence of the joint surfaces which leads to early arthritic changes in the acetabulum and the femoral head. The occurrence of aseptic necrosis of the femoral head is less frequent in central dislocations than in posterior dislocations. The results of treatment of dislocations of the central femoral head are determined mainly by the behavior of the articular surface of the acetabulum. In the selection of a conservative method of treatment of these injuries, not only must the pathologic position of the femoral head be corrected, but above all, the best possible reduction of the acetabular fragments must be obtained.

In the authors' clinic, first degree fractures of the acetabulum are treated with bedrest and immobilization of the lower extremity on a splint for from 2 to 3 weeks. After the third week, active exercise in bed is started. Weight bearing is not allowed before the fifth or sixth week. In fractures of the acetabulum of grades 2 and 3, with central dislocation of the femoral head, a wire is placed through the supracondylar region of the femur on the injured side. Reduction of the centrally dislocated femoral head is obtained by simultaneous traction in the long axis of the femur and at right angles to the long axis of the femur. If a parallelogram of forces is constructed the resultant vector will be seen to lie approximately in the long axis of the neck of the femur. Reduction of the displaced fragments of the surface of the acetabulum is carried out as early as possible. The fragments are manipulated by placing a finger in the rectum and pressing against the pelvic wall and acetabulum with this finger. Retention of the reduction is best obtained by continuous traction for from 6 to 8 weeks. Change in the position of the injured extremity while it is in traction is to be avoided, because of the possibility of redislocation of the femoral head. Theoretically, injury to the rectal wall by transrectal reduction of the acetabular fragments is a possibility but it has not occurred in the present series.

A diligent effort should be made to obtain reduction by the above methods before resorting to operative intervention. In general, a good reduction can be expected only if the injury is treated within the first 24 to 48 hours; after this the fragments are no longer sufficiently mobile to permit accurate reduction. In the presence of multiple fragments of the acetabular surface, an anatomical reduction of the acetabulum by transrectal manipulation cannot be expected, and operative intervention would be indicated.

—*Robert D. Larsen, M.D.*

The Treatment of Pertrochanteric Fracture of the Femur. GUNNAR STÖREN. *Acta chir. scand.*, 1956, 111: 333.

THE ISSUE in treating pertrochanteric (intertrochanteric) fractures is not one of simply attaining union, but rather it is a matter of reducing the mortality, the morbidity, and the impairment of final function that is so often encountered among the elderly patients who constitute the group most prone to intertrochanteric femural fracture.

A spirited controversy is waged between those who recommend internal fixation in order to avoid undesirable prolonged immobilization of these elderly patients, and those who assert that these same elderly

folks are often so debilitated that they cannot tolerate the trauma of an operative reduction.

Evans in 1951 reviewed the American and English literature. During the 1939 to 1949 decade the published mortality rate associated with the nonoperative treatment was 30.7 per cent. The comparable mortality rate associated with operative fixation was 16.8 per cent. Others, like Scott (1951) and Murray *et al* (1949), noted a lower nonoperative mortality. Each reported a mortality rate as low as 10 per cent in a group of personally treated patients who were subjected to immobilization. The results obtained suggested that elderly patients can tolerate protracted recumbency.

In order to delineate the relative merit of the opposing views, Stören has reviewed the experience in both the conservative and the operative treatment used at the Drammen sjukhus in Drammen, Norway. From April, 1949 to January, 1954 there were 54 patients treated by fixation with nailplate, 20 treated by traction only, 17 treated by combined nonoperative methods, and 13 untreated (because of a systemic disorder of serious nature.) The mortality rate with operation was 14 per cent, whereas with nonoperative therapy it was only 6 per cent. Open reduction reduced the period of recumbency from 9 weeks (with traction) to 4 weeks. However, final functional results, as ascertained from a questionnaire type follow-up, indicate a considerable incidence of reduced activity (80 per cent) in this operative group as compared to only a small incidence of reduced activity (20 per cent) in the nonoperative group.

Although the therapy applied was selected to suit each patient's need, so that each group is not truly comparable in terms of patient population, the author still believes that the review highlights the superiority of conservative management. The number of complications encountered with conservative therapy was not higher than that with internal fixation; the mortality rate was lower than with internal fixation; and the physical activity after conservative management was greater, with fewer patients experiencing hip pain or walking difficulties. —*Everett Shocket, M.D.*

ORTHOPEDICS IN GENERAL

Electrolysis and Stainless Steels in Bone. J. K. WRIGHT and H. J. AXON. *J. Bone Surg.*, 1956, 38-B: 745.

THE AUTHORS discuss the "mystery in the loosening of metal screws inserted in bone" and give a physical explanation. They indicate that there is no single answer to the problem and discuss electrolysis and its factors in the corrosion of metallic (stainless steel) appliances used in orthopedic surgery.

The primary process (physiochemical) encountered in electrolysis is the formation of a voltaic cell between two different chemically composed metals in an aqueous electrolyte, in which a current flows from one piece of metal (anode) to the other (cathode). During this process the anode gradually dissolves or corrodes, and the cathodes receive a coating of metal from the anode, or a deposit of hydrogen ions.

The authors indicate that the screw inserted into a bone is an anode. Corrosion will cause it to loosen because of the loss of metal from its surface and the gradual disappearance of the bone surrounding its contact site. The bone that is lost becomes replaced by fibrous tissue containing metallic particles which have wandered into it by mechanical and electrolytic means. Although tough, this fibrous tissue is weaker than bone and, thereby, is less apt to withstand mechanical strain. Once movement of the screw occurs because of this electrolytic factor, the mechanical factors increase, and more motion occurs, thus setting up a vicious cycle. The difference in the radiographic appearance of the defects due to bone erosion by electrolysis and those of bone erosion by movement of the screw are well illustrated.

The factors that influence the corrosion of stainless steel screws and thus lead to loosening of the screws are: (1) the differences in chemical composition which produce many phases for the setting up of the electrolytic process, and the mechanical factors which destroy the inert qualities needed in the steels used in orthopedics. The authors also refer to the composition of the materials made in America (referred to by Venable and Stuck) as being more satisfactory than those made in Great Britain. (2) The surface abrasion of the thin film of chromium oxide (10.5 millimeters), used in increasing the resistance of stainless steel, by the instruments used for insertion (drills and screw drivers) may readily cause electrolytic corrosion. (3) The "cold weld" effect demonstrated by Bowden, Williamson, and Laing as a factor in corrosion of stainless steels is also discussed (transfer of metallic particles from irregular surfaces at points of contact). (4) The effect of mechanical distortion of metals causing the distorted portion to become anodic with respect to the undistorted cathodic portion is well discussed and illustrated. (5) Differential oxygenation between two parts of the same metal results in electrolysis by the more highly oxygenated portion becoming cathodic, as frequently occurs when one portion of metal lies in scar tissue and another in granulation tissue.

The authors briefly discuss the effects of corrosion in clinical practice and also indicate that the most important points in the prevention of electrolytic corrosion are: (a) the use of identical metals in exactly the same metallurgical condition, and (b) careful handling of these metals before and during use to avoid abrasion of their surfaces and mechanical distortion. This article should be read in its entirety by surgeons using metallic means for orthopedic procedures. —*Daniel H. Levinthal, M.D.*

Studies on the Circulatory Conditions of the Lower Extremities in Cases of Congenital Hip Dislocation, with Reference to Treatment (Ricerche sulle condizioni circolatorie negli arti inferiori dei lussati congeniti di anca in rapporto al trattamento). ATTILIO RAMPOLDI and MARIO BONI. *Ortop. traumat. app. motore*, 1956, 24: 435.

TWENTY-FIVE CHILDREN with congenital dislocation of the hip formed the material for this study. In 12 of these patients the dislocation was unilateral, in 9 bilateral, and in 4 there was complete luxation on one side and subluxation on the other.

Oscillographic studies, aimed at determining the effects on the blood supply to the region of the hip

joint, were carried out with the cuff placed around the thigh up close to its base. The oscillographic apparatus was adapted to registering the vigor of the pulsations simultaneously on the two sides. The readings were always made with the child under narcosis and the pressure in the cuff was maintained during the reading at about 90 mm. of mercury, that is, the pressure was about that of the average pulse pressure for this region at the age of the subjects studied.

The treatment was in all instances that of Lorenz (Paci-Lorenz). The oscillograms were prepared before and after the reduction of the dislocation and putting up the luxated member in the first position of Lorenz. In 12 of the patients the oscillogram was taken both during the Lorenz 1 position and then after the extremity in the cast had been reduced to the Lorenz 2 position.

In the unilateral group of dislocations it was found that the oscillations, which were originally lower on the side of the luxation, became markedly higher on the luxated side than on the normal one after the assumption of the Lorenz 1 position.

In the group with complete luxation on the one side and subluxation on the other, the oscillations were of approximately the same amplitude on the two sides in some of the patients before treatment; in others they were more ample on the subluxated side. With reduction of the affected side and maintenance of the Lorenz 1 position, the oscillations became greater on this side than on the untreated one. When the subluxated side was treated there was no evident change in the pulse amplitude, just as in the case with the normal hip joint.

In the group with complete bilateral luxation there was little difference in pulse amplitude between the two sides before treatment. When both hip joints were reduced from their dislocated status and maintained in the Lorenz 1 position, the amplitudes were increased but not with any notable difference between the two sides.

When the position of Lorenz 1 was brought down into the position of Lorenz 2 after 3 to 4 months, the pulse amplitude did not change essentially.

The authors conclude that there is a modification of the circulation of the luxated limb after reduction of the dislocation, consisting in a higher amplitude of the oscillometric wave. However, the authors do not attempt to interpret the significance of such changes. Such interpretations will be attempted after further study has been done. —*John W. Brennan, M.D.*

End Results of the Treatment of Congenital Dislocation of the Hip Based on 1,086 Hips Treated Before the Age of 5 Years (Résultats éloignés du traitement de la luxation congénitale de la hanche d'après 1,086 hanches traitées chez des enfants avant l'age de 5 ans). E. ALLENBACH, E. WIEST, and M. C. WIEST. *Rev. chir. orthop.*, Par., 1956, 42: 169.

IN 682 PATIENTS 1,086 hips were treated and the results were studied and classified according to the classification of Howard and Massie. Many cases had a follow-up of 20 to 35 years. Only the results of the closed reductions are given. Arthrograms of the hip joint were regularly taken.

Experience has shown the authors that only 21 per cent of the patients had a perfect reduction of the head in the acetabulum. In the other patients a further reduction was gradually obtained in the plaster cast. Arthrograms were not used to determine the treatment. The usual treatment for dysplastic hips and luxations and subluxations in children younger then 1 year of age consists of applying a splint in the frog-leg position. In the older patients a closed reduction is performed and retained in a plaster cast. The hips are never placed in a forced position. Three plaster casts, each applied for a 3 month period, are followed by the application of splints during the following 9 months, permitting the child to move the hips to some degree.

For the prognosis the etiologic group and the age are most important. The end results of luxations and subluxations treated in children between 12 and 24 months and examined after 3 to 35 years are excellent in the same percentage (86.4 per cent to 89.5 per cent), while luxations and subluxations treated between 24 months and 5 years of age show excellent and good results in 59.4 per cent after subluxations and in 77 per cent after luxations. An anteversion of the femoral head of more than 40 degrees and an absence of reconstitution of the outer acetabular rim at the end of the orthopedic treatment causes a poor result. For this reason, the authors practice derotation osteotomy in 25 per cent of the cases and reconstruct the outer part of the acetabular roof in 20 per cent of the patients. Osteochondritis after reduction is the essential cause of poor results. It seems to be related to the antiphysiologic positioning of the hips.

An open reduction is indicated when a closed reduction is impossible. This actually happens in less than 15 per cent of all cases treated.

—*Joseph C. Mulier, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Physical Factors in the Dilatation of Vessels. SIMON RODBARD, S. LLOYD TEITELMAN, and LEO M. ZIMMERMAN. *Angiology*, 1956, 7: 309.

THE AUTHORS investigated the role of hydraulic factors in the genesis, progression, and prevention of tubular dilatations by studying the behavior of thin-walled rubber tubes. A segment of Penrose tubing was attached to a glass manometer tube, water was introduced into the system, and volume-pressure relationships were determined. At a critical pressure level, the weakest or most dependent section of the tube ballooned suddenly, producing a local "aneurysm." Maintenance of pressure by addition of fluid caused widening and longitudinal extension of the dilated segment, with elongation, tortuosity, and thinning and weakening of the wall. On withdrawal of fluid, the tube regained its original characteristics at a critical recovery point, and was again able to resist pressures almost up to the original ballooning point.

The ballooning tendency was related to the product of the applied pressure multiplied by the tube diameter, as was the recovery point, but at a lower level. External support permitted higher pressures before ballooning. Weakening of the wall, as by stretching the tube, lowered ballooning threshold.

These factors can be applied to explain the mechanics involved in such vascular dilatations as occur in aneurysms, varices and diverticula.

Discussion on the Clinical and Radiologic Aspects of Diseases of the Major Arteries. H. H. G. EASTCOTT, DAVID SUTTON, and C. G. ROB. *Proc. R. Soc. M.*, Lond., 1956, 49: 557.

IN THIS SYMPOSIUM, Mr. Eastcott discusses the fallacy of treating the x-ray picture rather than the patient. Arteriograms are presented which disclose atypical arterial patency in clinically ischemic limbs. The instances include among others, cases of venous gangrene and of gangrene caused by the selective obliteration of only the small vessels in a thromboangiitis obliterans process.

Dr. Sutton describes the technique of percutaneous needle puncture and the method of percutaneous arterial catheterization. In the latter either the femoral, carotid, or brachial artery is entered and by positioning the tip of the catheter, arteriograms can be obtained of the aorta, iliac, carotid, subclavian, or vertebral vessels. An instance of spontaneous intrathoracic thrombosis of the internal carotid artery was thus discovered. In the same manner, intrathoracic thrombosis of the subclavian artery was demonstrated and more cases like these are anticipated in the future.

In his discussion of therapy, Professor Rob indicates that his 85 arterial reconstructions for occlusive disease have been associated with poorer results than have his 55 arterial reconstructions undertaken for aneurysms. Also he found that the larger the vessel, the better the results.

In the occlusive group 28 patients with aortic and/or iliac disease had operations. Two died in the hospital and 2 subsequently had thrombosis. Of 37 patients who had femoral arterial reconstruction after occlusion, 18 subsequently had thrombosis and one died later. Fifteen cases of popliteal arterial occlusions have been followed by 6 post-reconstruction thromboses. Thus 24 aortic and iliac reconstructions, 18 femoral, and 9 popliteal remain patent to date.

In the aneurysmal group of 36 patients with aortic and/or iliac disorders operated on, 9 died postoperatively. All survivors have remained patent. Of 8 with femoral aneurysms operated on, only 2 had thrombosis, and of 8 with popliteal aneurysms, 1 had thrombosis and 1 died after dismissal from the hospital.

Autogenous vein grafts have proved disappointing, but perhaps this is due to a concomitant venous disorder in this group of patients. Follow-up of the patients with plastic prostheses has been short, but to date polyvinyl alcohol sponge has proved most satisfactory in 22 patients.

Of 99 patients who had homologous arterial transplants inserted, 14 had thrombosis in the hospital and 21 since discharge. There were 7 deaths in the hospital.

—Everett Shocket, M.D.

End-to-Side Bypass Homograft Without Resection in Segmental Arterial Occlusion. HAROLD LAUFMAN, ROBERT HOHF, VICTOR BERNHARD, and OTTO TRIPPEL. *Arch. Surg.*, 1956, 73: 418.

THE AUTHORS subjected a consecutive series of patients with ischemic symptoms of the lower extremities to arteriography and found that segmental occlusion of either the femoral or iliac artery was present in 78.3 per cent. Of this group 74.2 per cent, or about 50 per cent of the total, were considered suitable for bypass surgery.

The end-to-side bypass operation employing femoral and iliac homografts appears to hold several advantages over other procedures such as endarterectomy and resection of the occluded segment with end-to-end anastomosis of a graft replacement. The risks inherent in endarterectomy or in arterial resection with graft replacement appear to be virtually absent in the bypass operation. The existing circulation is not disturbed and is therefore not endangered. The incidence of failure appears to be less than that with other procedures. Unless an occlusion progresses rapidly in the host vessel, failure of a bypass graft results in no worse a circulatory status than that present prior to surgery. Reoperation in the event of failure is usually feasible and may be successful. The site for end-to-side anastomosis can be chosen sufficiently above and below the occlusion to work with the best possible host vessel.

Bypass surgery was not used when there was (1) myocardial damage of such severity that improvement in circulation of the legs may have led to more ambulation than the cardiac status could tolerate; (2) almost complete absence of distal arterial run-off, and (3) total absence of the popliteal artery lumen.

The first 19 bypass grafts performed by the authors were analyzed. Many of these operations were carried out in patients with borderline conditions, such as fair to poor run-off, and an extremely short popliteal stem. Of the 19 bypass grafts, 15 resulted in a restored distal pulse in the treated extremity. In 4 additional instances delayed failure of the graft occurred in from 6 days to 4 months. No additional failures occurred in this series in the 2 year follow-up period.

Complications consisted of edema, bleeding, and thrombosis. Edema of the lower leg lasting up to 4 months after operation occurred mainly in patients whose grafts measured more than 30 cm. in length. It was apparently due to overloading a narrowed distal arterial bed with arterial blood under high pressure. Delayed bleeding occurred in 3 patients and was due either to overheparinization or to delayed rupture of the graft. Grafts which became occluded by thrombus were usually extremely long or led into very short popliteal arteries with inadequate patency of the lower leg branches. In 2 instances an occluded bypass graft was bypassed by a new graft. One of these succeeded; the other failed.

All patients in whom a distal pulsation returned were markedly improved in their ability to walk. Pain was relieved in every case but one in which a moderate degree of heal pain persisted. Some subjective or objective evidence of symptomatic improvement occurred in several of the so-called failures. Subsequent sympathectomy was done in these cases if it had not been done prior to surgery.

The bypass procedure appears to have wide applicability in properly selected cases because of its several advantages.

Splenorenal Arterial Anastomoses. Elliott S. Hurwitt, Bernard Seidenberg, Henry Haimovici, and Donald S. Abelson. *Circulation*, 1956, 14: 532.

Anastomosis of the splenic artery to the left renal artery is a technique which has been demonstrated experimentally to be sound, and to have the following clinical applications: (1) aortic thrombosis; (2) aortic aneurysm; (3) renal artery obstruction; (4) renal artery injury; (5) renal artery aneurysm; and (6) anomalous renal artery.

Ascending aortic thrombosis may involve the renal arteries with consequent death due to renal failure or hypertension. This may occur either primarily or secondarily to thrombosis of an aortic graft. A detailed case report of such an instance is described. The patient, a 44 year old male, had a complete obstruction of the aorta just below the origin of the inferior mesenteric artery demonstrated by aortography. This obstruction was resected and replaced by a preserved aortic bifurcation homograft. An aortogram which showed complete block of the graft with extension to the level of the renal arteries was done 88 days postoperatively. In the hope of preventing death from renal failure should the occlusive process extend proximally, a left splenorenal arterial anastomosis was done. Fifteen months later both kidneys were functioning well, as determined by intravenous pyelography, urinalysis, and blood urea nitrogen level.

The technique of splenorenal arterial anastomosis is a possible solution to the problem of occlusion of both renal arteries for a prolonged period during resection and graft replacement of an abdominal aortic aneurysm that involves the origins of the renal arteries. Following such an anastomosis, the resection and replacement of the aneurysm may be performed, and the right renal artery then implanted into the graft or into the aorta at a higher level.

The method may prove of value in instances of obstruction of a renal artery with secondary hypertension. Provision of an adequate blood supply could conceivably reverse such hypertension and obviously avoids the disadvantages of nephrectomy. Similarly in aneurysm of the renal artery, if located close to the aorta, a splenorenal anastomosis distal to the aneurysm with resection of the aneurysm theoretically is an ideal procedure. The method may find limited usefulness in the treatment of traumatic wounds of the renal artery or in arteriovenous fistula of the renal vessels.

Finally such an arterial anastomosis may provide an additional and, perhaps, superior method of operative management in the cases of an anomalous renal artery crossing the renal pelvis or ureter and producing obstruction and hydronephrosis. Division of the artery with anastomosis of the distal segment to the splenic artery may avoid the necessity for plastic procedures on the renal pelvis or ureter, or for nephrectomy.

—*Thomas E. Boles, Jr., M.D.*

BLOOD; TRANSFUSION

The Safety of Stored Liquid Plasma—a Clinical Study. Paul I. Hoxworth and Walter E. Haesler, Jr. *Ann. Surg.*, 1956, 144: 336.

The great need for plasma in addition to whole blood and plasma substitutes is discussed in relation to the excessive waste of plasma from outdated blood and the need for stock-piling of this valuable adjunct in shock therapy. A program is outlined which has been used at the Cincinnati General Hospital since January, 1953 for the preparation of plasma and storage at room temperatures between 72 and 95 degrees F. for 6 months before use. The apparatus for removing plasma and storing it is described in detail, including the methods of filtering and final storage. Almost all filtering is carried out under air pressure and through sterile filters into sterile containers. Approximately 2 liters are lost in the filtering process, but a yield of 54 to 400 ml. units of plasma was usually obtained from a donor population of 72. One unit of plasma from each lot was given to a human volunteer as a pyrogen test. Bacterial contamination was found in less than 1 per cent.

The patients receiving this plasma were divided into two groups. Group 1 received plasma and whole blood. Three hundred and seventy patients were exposed to a plasma donor population of 3,694, or to 1,310 units of blood. Four in this group contracted jaundice. Group 2 received only pool plasma. In 164 patients exposed to plasma of 3,290 donors no jaundice developed. Between 73 and 83 per cent of these patients were followed up, but some problem was encountered in the follow-up as a number of patients receiving both blood and plasma or plasma alone expired of other diseases before hepatitis could have developed. However, these results suggest that the storage of liquid plasma at room temperature for 6 months eliminates active hepatitis virus

in pooled plasma. It is believed by the authors that such plasma can be given to patients without fear of serum hepatitis. —*Roger D. Williams, M.D.*

LYMPH GLANDS AND LYMPHATIC VESSELS

Complete Extirpation of the Thoracic Duct; Its Use in the Management of the Primary Benign Tumor Producing Spontaneous Chylothorax. ELMER R. MAURER. *J. Am. M. Ass.*, 1956, 161: 135.

THE CASE REPORT of a 37 year old woman who was admitted to the hospital because of possible acute appendicitis is presented. In percussing the chest, an area of dullness was found in the lower portion and auscultation showed decreased breath sounds. A chest x-ray disclosed a large effusion extending up to the sixth costal margin on the right side. A thoracentesis disclosed that the fluid was chyle, that it was sterile and contained no tumor cells. Treatment by repeated thoracenteses showed that very likely a cure was not to be obtained as the patient was losing ground. Consequently, a thoracotomy was performed and a leakage of chyle was found in the midportion of the posterior mediastinum on the right side. Exposure of the mediastinal contents disclosed a tubular structure extending from the diaphragm to the apex of the chest cavity and this tubular, soft and doughy cylinder was found to replace or surround the thoracic duct. The duct was doubly ligated at the diaphragm and high in the apex of the thorax. It was then completely removed, and in so doing the thoracic duct was completely extirpated. The patient had an uneventful convalescence and was well two years after the operation.

Gross and microscopic study of the tumor showed that it was a lymphangioma.

In this case the fall in percentage of lymphocytes in the blood smears before and immediately after surgery, with subsequent rise after removal of the thoracic duct tumor, suggested that an adequate collateral circulation was present and functioning. In the past it has been observed that following the rupture or ligation of the thoracic duct there is a striking drop in the number of lymphocytes and eosinophiles in the circulating blood. As lymphocytes are known to be carried through the thoracic duct to the blood stream, changes in the number of lymphocytes in the differential count can be used as a criterion for estimating the presence or absence of adequate lymph flow through collateral channels.

Since 1922, it has been known that the thoracic duct can be ligated with impunity. After ligation the collateral lymph circulation is established through embryonic lymph channels which normally do not function but which, in response to ligation, may be forced to enlarge and dilate. Also, after complete ligation, small communications are found to exist between the thoracic duct and the azygos and intercostal veins. This is understandable when one recalls that the lymphatics develop from discrete mesenchymal spaces that persist as lymph sacs with openings into veins. The embryonic thoracic ducts are bilateral and symmetrical and have numerous cross anastomoses. —*Matthew H. Evoy, M.D.*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

On Urinary Electrolytes in Operative Patients; Preoperative and Postoperative Studies. LASSI ANTILA. *Ann. chir. gyn. fenn.*, 1956, 45: Supp. 7.

CAREFUL SCRUTINY of the electrolyte composition and specific gravity of the urine during the first several days after surgery is the subject of this report from the Surgical Clinic of the University of Turkey.

During 1952 to 1953, the author selected 98 patients for study. Included were 25 patients undergoing herniorrhaphy, 5 with subtotal thyroidectomy, 16 with cholecystectomy, 34 with gastric resection, 5 with simple exploratory laporotomy, 3 with simple closure of a perforated ulcer, 4 with miscellaneous other intra-abdominal procedures, and 6 patients who were never operated on or anesthetized and constituted a hospital control group.

Urine was collected during the day prior to surgery (period 0), and then from the time of operation to 7 A.M. the following day (period 1). This interval was never less than 15 hours and never more than 20 hours. Periods 2, 3, 4, and 5 were successive 24 hour intervals.

The average specific gravity prior to surgery was 1.014. Postoperatively, in the group undergoing minor surgery (herniorrhaphy) the specific gravity was 1.020, 1.024, 1.022, 1.022, and 1.022 on successive days. For the group undergoing major surgery the average specific gravity postoperatively was 1.020, 1.024, 1.020, 1.019, and 1.020 on successive days.

Postoperatively there was typically a decrease in the sodium concentration. In the minor surgery group it was most often found in periods 3 and 4. In the major surgery group it was noted frequently in periods 1 and 2 as well. Thus 75 per cent of the patients in the major surgery group excreted less than 50 milliequivalents of sodium per liter in the third period.

Fluctuations in chloride concentration roughly paralleled the shifts of sodium. Only 40 per cent of the patients in the major surgery group excreted less than 50 milliequivalents of chloride per liter in the third period, and this was the period of the greatest incidence of hypochloruria.

Although urinary concentrations varied somewhat with parenteral therapy, the general trend varied but little. Some patients received glucose and saline therapy; others were recipients of a mixture of glucose and "balanced" saline solutions; still others received a mixture of glucose and bicarbonate periodically. Usually either 1 or 2 liters of fluid were administered during 24 hours. The precise composition of the "balanced" saline solution is not detailed.

Potassium was excreted most conspicuously in periods 1 and 2, and in quantities apparently beyond that released through tissue catabolism as computed from the quantity of phosphorus simultaneously excreted. The author confirms the findings of Abbot *et al* (1953) who reported the cumulative loss of potassium during the first four postoperative days to range from 100 to 400 milliequivalents, which represented 3 per cent to 12 per cent of the total body potassium.

—*Everett Shocket, M.D.*

Problems of Traumatic and Reconstructive Surgery in a Middle Sized Hospital (Probleme der Verletzungs und Wiederherstellungschirurgie im mittleren Krankenhaus). K. EBHARDT. *Medizinische*, 1956, p. 1134.

MODERN TECHNICAL advances in surgery have developed more rapidly than the reconstruction of new hospital facilities following the devastations of the war. The incidence of fracture patients is increasing in our hospitals, as are the operative procedures upon the extremities. The increase in seriously injured people can almost be likened unto war casualties.

One of the most striking indications of the improved surgical techniques is the marked reduction of amputated extremities following injury. Often, saving of these extremities means prolonged hospitalization. It has become more and more obvious that restoration of function depends more upon the injury to the soft parts than upon the fractured bone. Another important point aiding rehabilitation is immobilization in the position of function. Movement through a full range is encouraged in the uninjured parts.

As in earlier years, infection still plays an important role in the convalescence of the patient. We are seeing less and less of the severe infections (tetanus), but in spite of all efforts we still lose 1 or 2 patients a year because of this complication.

The advent of antibiotics does not permit the disregard for good surgical principles. There are still many cases of injury, especially of the lower leg, in which infection is the main reason for delayed healing. We are still having trouble clearing up chronic infections in spite of the many improvements. One of the most difficult infections to conquer is that of osteomyelitis of the calcaneus. We have seen it most often following the insertion of a pin for skeletal traction when a more proximal portion of the leg has been injured.

Nonunion at the site of fractures can be treated with numerous techniques depending upon the locale of the fracture. Bone drilling (Beck) or bone grafts (Phemister) can be used for healing problems of the shaft. The replacement prosthesis very often gives a serviceable joint when there is marked disruption of the articular surfaces. The prosthesis has been used most often in the hip joint. Arthrodesis of the knee joint is indicated for severe injuries. Hand injuries deserve special mention because of their relative frequency.

The article closes with a discussion of a special department for care and handling of the severely injured patient. —*Willaim B. Stromberg, Jr., M.D.*

Structural Changes in the Heart Resulting from Cardiac Massage. GEORGE H. PEDDIE, OSCAR CREECH, JR., and BÉLA HALPERT. *Surgery*, 1956, 40: 481.

THE HEARTS OF 14 PATIENTS who underwent cardiac massage and died subsequently were the basis for this

study of alterations occurring in the heart and pericardium.

One of the immediate changes which was observed was a hemorrhagic pericardial effusion. This was present in all of the hearts of the patients who died immediately and in the one who died at the end of 6 hours. In 4 of the 7 hearts, ecchymoses and petechial hemorrhages were present in the epicardium, and gross hemorrhages were seen in the myocardium. One heart ruptured during massage, but this was thought to be the result of acute coronary occlusion followed by ischemia.

Four patients survived the massage from 1 week to 1 month. In 3 of these, the hemorrhagic effusion had become turbid. Microscopically, there was minimal pericardial reaction consisting of infiltration of lymphocytes, plasma cells, and large mononuclear cells. Residual myocardial damage was found in one patient.

Two of the patients died 63 and 79 days respectively, following massage. In one, the pericardial cavity was obliterated by delicate and dense fibrous adhesions, and the epicardium was thickened. In the other, there was a thin layer of connective tissue interspersed with chronic inflammatory cells covering the epicardial surface. In neither case was there any evidence of myocardial change.

Myocardial damage appeared to be related to the duration of massage and was aggravated by previous myocardial changes. Pericardial reaction, on the other hand, developed irrespective of the duration of massage. —*John J. Bergan, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Maintenance of Respiratory Function Following Injury. FRANK F. ALLBRITTEN, JR. and EVAN L. FREDERICKSON. *Surg. Clin. N. America*, 1956, 36: 1221.

THE NEED for the preservation of respiratory function under the difficult circumstances usually encountered concomitant to trauma is equal to the need for control of hemorrhage. The latter is obvious and terrifying and, by its visual evidence, claims priority, while respiratory deficiency, subtle in its manifestations, may be totally unrecognized. The final result of treatment can be catastrophic because of failure of recognition of the need for support of the respiratory requirements.

Each patient should be considered from the standpoint of three fundamental defects: first and most common, obstruction of the respiratory passageways; second, the failure of the thoracic neuromuscular-skeletal system; third, the alteration of the normal intrathoracic and atmospheric pressure differential.

Emergency support should be directed toward insuring the maintenance of an adequate effective volume by means immediately available. An irretrievable opportunity for salvage can be lost searching for and administering drugs of doubtful effectiveness as "respiratory stimulants" when the patient's inherent respiratory chemical stimulus, emotional reactions, and reflex controls are undoubtedly functioning maximally toward that end. A similar situation occurs in the effort and time lost in seeking out and administering ventilatory gases when the surrounding atmosphere completely satisfies respiratory requirements if a normal ventilatory volume is provided. The administration of additional carbon dioxide to the patient laboring to dispose of an accumulation of the gas is an absurdity that continues to be indulged.

Total cessation of respiratory effort following injury in a situation devoid of equipment requires prompt institution of ventilation preceded only by the removal of any obstruction of the respiratory tract.

There is little doubt that the injured patient can be better ventilated more promptly, conveniently, effectively, and with less physical manipulation by using the ventilatory activity of the operator as a power source than by any other method. By mouth-to-mouth, mouth-to-nose, mouth-to-mask, or mouth-to-tracheotomy tube ventilation the operator is immediately aware of airway obstruction and the volume of gas insufflated into the subject's respiratory system. The objection to the low oxygen tension or elevated carbon dioxide content of the expired respiratory gas of the operator is not realized in application, since the hyperventilation indulged by the operator changes these values to totally acceptable levels.

The numerous, excellent mechanical devices for ventilation simplify the problem immeasurably when available, but the delay in establishing operator insufflation ventilation while awaiting their arrival cannot be rewarding.

The most frequent emergencies arise from obstruction to the airway by a foreign body, injured and edematous soft tissues, and retained secretions. The last condition deserves particular attention, since tracheostomy is too long delayed in hopefully awaiting the injured to clear the airway by his own efforts. The failure to relieve obstruction of the upper respiratory passages or control the aspiration or retention of secretions in the tracheobronchial tree is the prime indication for tracheostomy. If the situation is such that emergency tracheostomy is seriously considered, it should be completed without further delay.

The true emergency tracheostomy little resembles that done deliberately. The prospect of post-tracheostomy laryngeal stenosis has been made sufficiently fearsome, so that the advantage of the cricothyroid tracheotomy is now rarely recognized. The prospect of finding the trachea in the lower cervical region is a deterrent to the neophyte in the procedure, and even the experienced would not relish the prospect of exposing, incising and maintaining the tracheal opening with only pocket knife and fingers for instruments. Under the circumstances it is more advisable to plunge the knife transversely in the easily palpable groove between the thyroid and cricoid cartilages, severing the cricothyroid membrane. The handle of the knife or other available object, e.g., a screwdriver, should be twisted transversely in the incision, spreading the laryngeal and cricoid cartilages to provide a gaping airway. Such a tracheostomy is intended only as a truly emergency procedure; as such it may be lifesaving, and should be promptly converted to the classical type in order to prevent laryngeal stenosis that will likely follow unless early abandonment of the temporary ostium occurs.

The tracheostomy opening may be cannulated by various tubes for tracheal aspiration and insufflation. The use of a vacuum for assistance in deflation, as well

as a positive pressure inflation phase, will produce a greater ventilatory volume with less pressure required for inflation. The continuous use of this type of apparatus for respiratory assistance for patients with anterior poliomyelitis has verified its functional usefulness and safety.

Failure of the thoracic neuromuscular-skeletal system results in the impairment or loss of ability to change the volume of the total intrathoracic space. The loss of the neuromuscular function can be replaced by inflation of the lung by intermittent blasts of positive pressure into the airway with a vacuum phase to assist in deflation and to increase the total volume flow.

Failure of the skeletal system (multiple rib fractures, sternal fractures, "stove-in" chest) gives the same end result as neuromuscular failure; i.e., there is inadequate thoracic wall movement to change the intrathoracic volume sufficiently to give adequate pulmonary inflation. Numerous methods have been described to provide support after injury of sufficient extent to impair the stability of the thoracic wall. Usually these are found to be of little value.

The last of the fundamental considerations concerning the support of the ventilatory function following trauma concerns the alteration of the normal intrathoracic and atmospheric pressure differential. Any lesion establishing a communication between the atmosphere and the intrapleural space accomplishes this unhappy result whether it be through thoracic wall, lung parenchyma, tracheobronchial tree, esophagus or diaphragm.

The primary effort should be directed toward the re-establishment of the pressure differential. The immediate occlusion of any accessible point of communication between pleura and atmosphere, followed by the re-establishment of the pressure differential by needle aspiration or tube drainage, will serve to restore adequate function promptly. A particularly serious situation arises when the intrapleural pressure rises above that of the atmosphere, for under this circumstance the mediastinum is forced to the uninvolved side and respiratory failure occurs rapidly unless the pressure differential can be restored to normal.

The most appropriate method of supporting the respiratory function following injury is discussed. Particular emphasis is placed upon the security and advantages accruing from reliance on pulmonary insufflation and tracheostomy to assure a consistently adequate ventilatory volume.

—*John E. Kirkpatrick M.D.*

Assaying Body Damage in the Automobile Accident. JAMES C. DRYE. *Surg. Clin. N. America*, 1956, 36: 1209.

MORE USEFUL YEARS of life are lost because of trauma than because of any disease, including cancer and heart disease. For the most part the people involved in automobile accidents are, otherwise, healthy and usually in the active, productive years of life. The permanent disablement or death of a young man with a dependent family, or of a young mother, is a serious loss to the community. The reclamation of such persons is most important.

The author describes in detail the management of trauma resulting from the varied forces acting on the body at the time of an automobile accident. He points out that anything can happen, but that trauma usually follows definite patterns; consequently a detailed account of the circumstances at the time of or after the impact is helpful in directing attention to the more likely areas of severe injury.

When an injury has been sustained in an automobile accident an immediate appraisal will reveal severe respiratory distress, or severe external hemorrhage which prompt effective treatment may control and may be lifesaving. The evaluation of the degree of shock should be made early, and appropriate measures taken to control it at once.

A complete examination of the entire body must be made; however, it should be orderly with the first things of importance being done first. This often demands the institution of immediate life-supporting treatment and the delaying of other diagnostic procedures which require unnecessary moving of the patient from the stretcher to the examining table, the x-ray and the operating table. The author emphasizes that eventually every part and organ of the body should have diagnostic attention.

The failure to recognize the degree of shock, a ruptured viscus, or a concealed hemorrhage such as epidural, thoracic, abdominal, or retroperitoneal, and an unawareness of insidious impairment of respiratory function usually cause death.

In summary, the variations of trauma are almost endless, and those resulting from traffic accidents especially so. The forces exerted are great, and multiple injuries of varying degrees of severity are the rule. The physician who attends these victims is called upon to meet the most demanding requirements of thoroughness, common sense, judgment, and decisiveness of action if the patient is to do well.

A large percentage of traffic accidents result in only minor injuries, but the total number of people severely injured and killed each year on our streets and highways is great. —*John E. Kirkpatrick, M.D.*

The Control of Hemorrhage and Further Management of Traumatic Shock. HOWARD E. SNYDER. *Surg. Clin. N. America*, 1956, 36: 1231.

A REDUCTION in the circulating blood volume is now recognized as the prime etiologic factor in traumatic shock. Most often this reduction is due to loss of whole blood. Only a few conditions rate priority in attention to obvious gross hemorrhage. These conditions include an obstructed airway, a sucking wound of the chest and a tension pneumothorax.

The methods of control of hemorrhage, however, will bear some repetition. Manual pressure over the wound or pressure exerted by a compression dressing will control capillary ooze and venous hemorrhage. The immobilization of a fractured and/or badly wounded extremity will lead to a diminution in blood loss. Utilization of pressure points or compression of a main artery proximal to a wound will occasionally prove useful. In traumatic amputations and in other open wounds accessible blood vessels may be caught with a hemostat and tied by ligature. Hemostats and ligatures should be avoided in controlling hemorrhage from main arteries which may be subject to repair at initial surgery. The tourniquet in most instances should be reserved for those cases in which hemorrhage from

a limb cannot be controlled by one of the aforementioned methods, such as for complete amputations. Lives were lost under the old rule of releasing the tourniquet every 30 minutes, and the Army has abandoned this rule.

Unfortunately, hemorrhage is not always obvious, but may be concealed. Such is the case in many abdominal wounds and injuries. When the rapid administration of 1,000 milliliters of whole blood does not lead to an elevation of the blood pressure in a patient in severe shock, immediate exploratory laparotomy is indicated. Most frequently continuing intra-abdominal hemorrhage is found in these cases. Occasionally gross contamination with peritoneal exudation and loss of plasma leading to shock is found. Continuing hemorrhage within the chest which may be responsible for continuing shock is rarely encountered.

Traumatic shock is encountered in certain conditions in which there is loss of plasma in excess of the amount of loss of whole blood. Such conditions include gross soiling of the peritoneum or pleura with intestinal content in abdominal and thoracoabdominal wounds, gas gangrene or clostridial myositis, particularly of the wet type, and burns. Exudation into the peritoneum or pleura from extensive soiling frequently is recognized only after opening the abdomen or thorax. In such cases one often proceeds with laparotomy or thoracotomy because the patient fails to respond to the rapid administration of 1,000 or 1,500 milliliters of whole blood. When such is encountered, a shift should be made immediately to the infusion of plasma or plasma expander in the therapy of shock.

Aside from loss of whole blood and/or plasma there are other important etiologic factors in shock. Chief among these are those wounds or injuries which produce alterations in the cardiorespiratory function. Decompression of a dilated stomach is frequently indicated.

Clinical experience and experimental evidence indicate that pain is operative in the production of shock only so long as pain exists and that, with the relief of painful stimuli, shock from this etiologic source is corrected.

The patient in severe shock from hemorrhage is entitled to rapid and urgent methods of restoration of blood volume. When group O Rh-negative blood, low in titer for agglutinins A and B is available, it is the replacement agent of choice and should be given rapidly. It is recommended that 500 milliliters be given in as little as 5 minutes and 1,000 milliliters in 10 minutes in such patients. When there is no response in blood pressure to such therapy, the patients should be considered candidates for immediate operation upon that area of the body which is the most likely source of uncontrolled bleeding. This operation should be planned to start about the time the third bottle, or 1,500 milliliters, of blood has been administered rapidly.

In some instances blood is not available immediately. There is evidence to show that wet plasma stored 6 months at room temperature is a safe plasma to use and does not lead to infectious hepatitis. Such plasma is useful as a substitute for blood when blood is not available, and it is very useful when reduction in blood volume is due to plasma loss. When plasma has been used as a plasma expander in lieu of whole blood, it tends to remain within the circulation and prohibits the use of necessary amounts of whole blood to restore a satisfactory hemoglobin or red cell level. In such circumstances it should be given only in sufficient quantity to maintain life until blood becomes available.

Not to be forgotten in the management of the patient in shock is the provision for correction of dehydration. It is particularly true in battle that patients in shock are dehydrated. It is not infrequently true in civilian practice. The administration of glucose in water or electrolyte solution should not be instituted until the systolic blood pressure has attained a level of some 80 mm. of mercury unless other fluids for blood volume replacement are not available. How much of a role dehydration plays in shock has not yet been determined. Certainly its correction is important, not only in combating shock but in preventing one of the serious complications of prolonged shock, namely, a pigment nephropathy with oliguria and anuria following. Enough fluid should be given to lead to a minimum urinary output of 40 cubic centimeters per hour.

The differential diagnosis of shock is not difficult in healthy persons, such as those who are members of the armed services. In civilian life the reverse may be true. Shock or peripheral circulatory failure must always be differentiated from acute cardiac failure, cardiac tamponade, hemorrhage or emphysema in the mediastinum obstructing the superior vena cava, pulmonary embolism, poisoning from barbiturates, alcohol or morphine, and coma from head injuries.

The widespread use of ACTH, cortisone, and cortisone derivatives has introduced a new problem in the differential diagnosis of shock. Persons who have had such products, even 1 to 2 months prior to operation or trauma, may manifest signs of adrenal insufficiency at the time of trauma or operation. Adrenal insufficiency must always be suspected in those who have hypotension following operation or trauma, yet this suspicion should not lead the unwary observer into ignoring blood loss or true shock as the cause of the hypotension.

Certain other drugs now in common use may be incriminated in postoperative or posttraumatic hypotension. Chlorpromazine (thorazine), promethazine (phenergan), and other so-called tranquilizing drugs may make patients refractory to vasopressor drugs and may to some extent obviate efforts to combat shock. So many people have become chronic users of these drugs that a history of such intake becomes as important as knowledge of cortisone intake. The Trendelenburg position is important, and infusion of norepinephrine will be found to be the only pressor drug which will give anything like a consistent response in hypotension of chlorpromazine origin. The use of epinephrine, vasoxyl or norepinephrine for traumatic shock per se is never indicated.

—*John E. Kirkpatrick, M.D.*

Emergency Management of Wounds of the Large Blood Vessels. HARRIS B. SHUMACKER, JR. *Surg. Clin. N. America*, 1956, 36: 1329.

OPERATION must be carried out promptly whenever there is persistent bleeding from major vessels, a pul-

sating hematoma with threat of rupture or neural compression, and also in all cases of persistent ischemia. The longer the period of ischemia the more likely is it that thrombosis of the distal arterial tree will have occurred. Under such circumstances the clot can sometimes be extracted and successful restoration of blood flow be achieved.

As shown by experience in the Korean war, immediate definitive surgery is the desired objective. The affected vessel must be controlled both proximally and distally before attacking the site of injury itself. The author favors the use of an everting mattress suture. If the freed ends of the injured artery can be approximated end to end, the procedure is better than the interpolation of a graft. Experiences with arterial obstruction resulting from obliterative disease have demonstrated that end-to-side by-pass grafts are superior to end-to-end interposition.

In the cases of traumatic arterial thrombosis and segmental arterial spasm, spinal anesthesia, procaine sympathetic blockade, periarterial injection of procaine, or adventitial striping and injection into the lumen of priscoline or procaine may relieve this spasm.

The ischemic extremity must be handled with great care. It should be made dependent to the heart level. Pressure from bed clothes upon the extremity should be avoided. Local application of heat should not be used because of the likelihood of precipitating gangrene. The author does not favor the use of local refrigeration. —*Alan Thal, M.D.*

Emergency Management of Major Injuries of the Extremities. Oscar P. Hampton, Jr. *Surg. Clin. N. America*, 1956, 36: 1261.

A major injury of an extremity is one which, unless given precise surgical management, will result in a significant impairment of function or perhaps in a loss of the limb. For this discussion major injuries of the extremities include only open and certain closed fractures of the long bones, open wounds of the joints, dislocations of the major joints, and massive ligamentous tears.

Significant first-aid measures include the application of dressings to wounds, the arrest of hemorrhage by compression dressings or, rarely, a tourniquet, and adequate emergency splinting for fractures. A sterile or merely clean dressing prevents further contamination of a wound and tends to stop bleeding. A compression dressing or, when necessary, a tourniquet may prevent loss of life from hemorrhage. Effective emergency splinting of fractured extremities minimizes discomfort, prevents further damage to soft parts, tends to prevent or overcome shock, may avoid delayed compounding of a fracture, and prepares the patient for safe and comfortable transportation.

Emergency splinting of fractured extremities may be provided by standard splints and methods, or it may be improvised. The use of standard splints, while highly preferable, is often not feasible. Since improvised splinting can be made effective, the lack of standard splints in no way relieves the physician of his obligation to provide effective emergency splinting for fractures of the extremities at his first opportunity.

For adequate splinting of injuries distal to the elbow a cock-up or a board splint is desirable, but is really essential only when both bones of the forearm are completely broken. For injuries above the elbow the position of the arm at the side, with the elbow flexed about 90 degrees, is by far the most comfortable. Adequate splinting in this position is easily provided by the use of a sling to support the forearm and by binding the arm to the chest with another sling serving as a swathe or with several turns of a roll of bandage.

The most effective emergency splinting for a lower extremity is that provided by fixed traction in standard Thomas or hinged half-ring splints. Care must be taken to make certain that the traction hitch about the foot and ankle does not cause excessive pressure on the dorsum of the foot. To that end the traction hitch may be applied over the shoe, which is not removed. Only moderate traction is necessary.

Improvised splinting, while not ideal, can be highly effective. For fractures of the femur at any level and for fractures of the tibia at the knee, the ideal improvised emergency splinting consists of 3 well padded board splints. Posterior and medial padded boards extend from the upper thigh, and a lateral padded board extends from the axilla to the foot. The latter is securely bound not only to the extremity but also to the abdominal and chest walls.

For fractures of the lower two-thirds of the leg 2 or 3 padded coaptation board splints, extending from the upper portion of the thigh to below the foot, provide effective splinting. Also, the pillow splint, in which a pillow provides the padding while posterior, medial, and lateral boards provide the immobilization, is highly effective emergency splinting for fractures of the leg. For fractures about the ankle a pillow bound snugly to the leg and foot may often furnish adequate splinting. When board splints are applied to the lower extremity, sufficient and properly arranged padding must protect the malleoli and the head of the fibula to avoid pressure on the peroneal nerve which could cause peroneal paralysis.

An open wound communicating with a fracture site is hazardous for many reasons, but principally because of the danger of secondary infection and the failure of the wound and fracture to heal. An infected, open fracture is serious for the following reasons: nonunion may follow; massive sequestration of bone may take place; adjacent joints may be destroyed; or infection may endanger life or limb. At best, wound healing is slow and is accompanied by an excessive formation of scar tissue. The common denominator in all these wound infections is dead and devitalized tissue. The basic principles of management of open fractures call for the surgical elimination of this pabulum of sepsis.

First-aid treatment of open fractures consists in the application of a sterile dressing and proper splinting. Antiseptics are definitely contraindicated. Protruding fragments of bone should not be replaced in the wound, but should merely be covered with the dressing. It follows that in applying fixed traction in emergency splinting the amount of traction should not be sufficient to cause protruding fragments to recede into the depths of the wound. Immediate hospitalization is indicated and antibiotics and appropriate antitetanus prophylaxis should be initiated promptly.

Open fractures should have prompt, thorough investigation, appraisal, and treatment in a well equipped

operating room. The emergency room is no place for the evaluation of an open fracture. After the treatment of hemorrhage or wound shock, with adequate roentgenograms visualizing the entire length of the broken bone, and with the patient under anesthesia the open wound is thoroughly examined.

Exposure of the depths of the wound must be adequate. Inadequate exposure leads only to inadequate débridement. An incision should not cross the center of a wound running in the opposite direction, since this would create a crucial incision. Rather, proximal and distal incisions from a transverse or circular wound should begin at opposite corners of the wound so as to leave in effect a Z-shaped incision which facilitates later repair by suture.

The decision to suture the wound immediately requires sound surgical judgment. An immediate successful suturing of the wound is most advantageous, but an unsuccessful closure, as a result of abscess formation or necrosis of skin margins from excessive tension, is worse than if the wound had been left open to heal by granulation.

Primary closure of clean, well débrided wounds of open fractures is usually feasible, particularly within 12 to 16 hours after injury, provided closure is surgically feasible without excessive tension, both at the time of the closure and later after swelling of the wound margins has occurred. Conversely, when the surgeon cannot be sure that the wound is free of the pabulum of sepsis, or if closure by suture might lead to excessive tension, an open wound is highly preferable despite its inherent hazards. Frequently, excessive tension can be eliminated by long full-thickness relaxing incisions parallel to, but several inches from, the suture line.

If for a good reason the wound is left open, a delayed closure between the fourth and seventh days is indicated if it is surgically feasible and if the wound is clinically clean. The problem of surgical closure, primary or delayed, of an open wound with a fracture versus the advantages of an open wound for drainage as a safeguard against deep infection is one that may severely tax the judgment of even the most experienced surgeon.

The use of internal fixation in open fractures is a calculated risk. In doubtful instances it is preferable to use some method of management of the fracture other than internal fixation and direct all efforts toward wound healing.

In closed fractures certain complicated fractures may require internal fixation to preserve function.

In fractures of the upper extremities the surgeon must constantly keep in mind that the most important consideration is the preservation or restoration of the function of the hand. Solid bony union of the fracture in good alignment, with preservation of the motion of all the joints above the hand is highly desirable, but in the attempt to achieve this the ultimate function of the hand must not be jeopardized. It is far better to accept some bony deformity and even some restriction of motion in joints above the hand and still preserve all its function than to obtain perfect bony alignment and full motion of the major joints at a premium of impaired hand function.

In the lower extremity, on the other hand, the objective is to obtain a healed fracture which permits painless, stable weight bearing. Movable joints for locomotion and full length are highly desirable, but even these take second place in importance to a pain-free, stable extremity which will support amply the weight of the body. Moreover, full length is not essential for excellent function, and often it is preferable to insure excellent contact of fragments at the price of some shortening in preference to overcoming all shortening at the risk of distraction and nonunion.

Internal fixation methods are described and illustrated for fractures of the shaft of the femur, T-fractures of the lower end of the femur, and fractures of both bones of the leg.

Any wound which involves a joint is a serious wound. The damage at wounding, however slight, immediately prejudices the subsequent function of the joint. Of even greater importance, every wound of a joint is a potential site of suppurative arthritis. If that process becomes established, all function of the joint may be lost, and, especially if the affected joint is in the lower extremity, life as well as limb may be endangered.

An open wound of a joint is a true surgical emergency which warrants thorough investigation in the operating room under anesthesia. The principles of débridement of wounds are interpreted to include an adequate arthrotomy sufficient to permit removal of all foreign bodies and material and devitalized areas of articular cartilage which result from trauma or superimposed suppuration.

Open drainage incisions are seldom, if ever, indicated as the treatment for wounds of joints or for suppurative arthritis. Such a process can be eliminated more effectively by a thorough intra-articular cleansing followed by closure of the joint, instillation of penicillin supplemented by systemic antibiotic therapy, and immobilization.

Dislocations of major joints are true surgical emergencies. Reduction of many fractures may be carried out several days after injury with no prejudice to the end result. The longer a dislocation remains unreduced, however, the greater the incidence of complications. Prolonged stretching of adjacent major nerve trunks or blood vessels may cause temporary or even permanent paralysis or ischemia and possible gangrene. Moreover, an open reduction may be necessary, and the end results thereafter often are not optimal. Even if a delayed closed reduction is possible, post-traumatic inflammatory processes about the joint, made worse by the delay in reduction, are likely to limit the return of function. For these reasons, dislocations of major joints deserve prompt reduction.

Dislocation of the hip occurs most commonly when a front-seat occupant of an automobile in a collision is thrown forward so that a knee strikes the dashboard. The force of the impact travels up the femur and forces the head out of the acetabulum posteriorly. Frequently the posterior wall of the acetabulum is fractured and driven ahead of the femoral head. Often the diagnosis is overlooked. The patient may be unconscious, a fact which tends to minimize examination. An associated open fracture of the patella is so evident that an injury in the region of the hip goes unsuspected.

True dislocation of the knee is a relatively rare injury which is produced by direct violence to the

proximal end of the tibia or distal end of the femur while the knee is extended or by a forced hyperextension of the leg at the knee. For this dislocation to occur, both collateral and both cruciate ligaments must be torn. Probably a momentary incomplete dislocation with spontaneous reduction occurs occasionally. In these instances, although a dislocation of the knee is not present when the patient is examined, there is marked instability in all directions.

Closed reduction of a complete dislocation of the knee is usually obtained easily by traction and manipulation. An immediate operative repair of the torn collateral and, perhaps, the cruciate ligaments will predispose to the optimal end result in the shortest period of time, even though many excellent results have been obtained in knees after closed reduction and immobilization in a plaster cast for 2 or 3 months.

A tear of either collateral ligament of the knee produces, in effect, an incomplete dislocation and is worthy of consideration among the major injuries to the extremities. The indicated treatment varies with the extent of the tear, which is determined by the amount of abnormal lateral mobility.

When the degree of lateral instability exceeds 15 degrees, primary operative repair is usually the treatment of choice. This permits a thorough intra-articular inspection. If the adjacent semilunar cartilage is torn, it can be removed. The torn ligament is often found folded on itself, so that, without operation, the integrity of the ligament would not be restored by healing processes.

The accurate surgical repair of the torn collateral ligament predisposes to the optimal functional result for such a severe injury in the minimum period of time.

—*John E. Kirkpatrick, M.D.*

The Prevention and Control of Postoperative Wound Infections Due to Staphylococcus Aureus. CHESTER W. HOWE. *N. England J. M.*, 1956, 255: 787.

DURING 1954 through 1955 the carrier rate of Staphylococcus aureus and the incidence of penicillin-resistant strains in carriers were significantly reduced at the Massachusetts Memorial Hospitals. The postoperative wound infection rate was cut almost in half.

The author attributes these improvements to the establishment of measures to prevent cross-contamination and dissemination of antibiotic-resistant bacteria. Routine use of antibiotics was abandoned on the house service late in 1953, and thereafter antibiotic treatment was limited to established infections. Bacteriologic cultures were made in order to identify the organism and to make the choice of antibiotics selective.

Preventive measures introduced in the operating room were the wearing of 2 face masks during operations and the change of face masks every hour and a half during long operative procedures. A 10-minute surgical scrub with a G-11 soap was also advocated to lower the incidence of staphylococcal wound infection.

In the surgical wards, personnel changing septic dressings were urged to wear face masks and gloves in order to keep the personnel from becoming carriers. Early control of wound infections tended to prevent the dissemination of resistant organisms. Infected wounds were converted into clean wounds by drainage, débridement, and early secondary closure.

Host factors are influential determinants of wound sepsis. The general condition of the patient and the technical management of the wound are important.

—*Gilbert S. Campbell, M.D.*

ANESTHESIA

The Etiology and Treatment of Laryngeal Spasm. BERNARD RAYMOND FINK. *Anesthesiology*, 1956, 17: 569.

RECENT STUDIES have brought forward the evidence that closure of the human larynx is not that of a simple sphincter, but involves a dual mechanism consisting of a shutter and ball valve. The shutter is formed by the vocal cords. The ball valve is constituted by the false cords and pre-epiglottic body and is probably controlled by extrinsic laryngeal muscles. Reflex closure of the glottis, passive closure of the glottis, and reflex closure of the larynx are three distinct mechanisms, each liable to obstruct respiration during general anesthesia.

Reflex closure of the glottis is due to a shutter-like adduction of the vocal cords, occurs during light anesthesia, and is a response to somatic sensory stimulation.

Passive closure of the glottis may be initiated by the inspiratory flow of gas when the glottic Bernoulli effect is unopposed by adduction of the vocal cords. Further inspiratory effort may suck the vocal cords together so strongly that complete obstruction results. This condition occurs in deep anesthesia.

Reflex closure of the larynx is operated mainly by extrinsic muscles. It is due to a ball valve mechanism consisting of the preepiglottic body and false cords. This closure mechanism is a protective reflex response to visceral sensory stimulation and part of a general expiratory spasm which represents an extreme form of cough.

Reflex respiratory stridor can be overcome by any maneuver that keeps the cords separated during inspiration. Reflex closure of the larynx can be abolished by stopping the stimulus, either by topical or local anesthesia or by interruption of the manipulation which has caused the reflex. Deepening of the plane of anesthesia will prevent a recurrence of the spasm. Paralyzing muscle relaxants abolish the reflexes effectively.

—*Mary Karp, M.D.*

Respiratory Adjustments to Increases in External Dead Space. GORDON B. CLAPPISON and WILLIAM K. HAMILTON. *Anesthesiology*, 1956, 17: 643.

ALTHOUGH it has been a matter of common knowledge that increases in external dead space would cause an increase in tidal and minute volumes in subjects able to increase their ventilation, the quantitative aspects of those increases, particularly with quite small dead space increments, have not been well delineated. This investigation was undertaken to determine the effects of such increases in external dead space on certain respiratory functions.

The respiratory responses of a group of normal, unanesthetized subjects to a small (125 cubic centimeters) increase in external dead space were determined under resting conditions. A statistically significant elevation of end-expiratory carbon dioxide was found, as well as significant increases in tidal and

minute volumes. However, the minute volumes increased less than the calculated increased dead space minute volume. —*Ely Elliott Lazarus, M.D.*

The Use of Succinylcholine in Anesthesia for Thoracic Surgery; an Analgesic Technique. WARREN H. ASH. *Current Res. Anesth.*, 1956, 35: 440.

THE AUTHOR discusses a series of 50 cases managed with light anesthesia and succinylcholine drip. Cyclopropane was used for induction. In the first 15 cases an intravenous drip of 0.2 per cent of succinylcholine was started as soon as the patient was asleep. In the remaining 35 cases 0.2 per cent procaine was added to the succinylcholine drip in order to further depress reflex activity. An endotracheal tube was inserted invariably within 3 minutes, and anesthesia was then maintained with a flow of 3 liters of nitrous oxide, 2 liters of oxygen, and a continuous drip of succinylcholine or succinylcholine-procaine.

Controlled or compensated respiration was used. A minimum of physiologic upset was noted both during and immediately after surgery. The use of extremely light planes of anesthesia allowed normal reflex activity during surgery. This was evidenced by a slight elevation in the blood pressure after surgical stimulation. Muscle tone could be regained in a matter of seconds. The return of the patients to full consciousness was immediate, once the intravenous drip was discontinued and the nitrous oxide analgesia terminated. It was not unusual for the patient to converse rationally in the operating room immediately after extubation, although it was rare for the patient to have any recollection of this conversation. Amnesia did not disappear until the patient was back in his room. There was no nausea and vomiting.

Although rather demanding of the anesthesiologist, this technique was extremely useful in that induction was almost immediate, endotracheal intubation could be performed within a few minutes of induction, physiologic insult was minimal, recovery was immediate, and postoperative anesthetic complications were not seen. —*Robert P. Bergner, M.D.*

Anesthesia for Operations Involving the Aorta and Its Major Branches. G. BITTENBENDER, ROLAND TINDEL, and NAOMI DALTON. *Current Res. Anesth.*, 1956, 35: 429.

THE AUTHORS discuss 51 procedures, performed on 45 patients, during which the aorta or its major branches were resected with vascular continuity being restored by homograft or prosthesis. Sixty-six per cent of the patients had severe associated cardiovascular disease. Only 11 per cent did not demonstrate serious associated pathologic conditions.

As regards anesthetic techniques and problems, the cases fell into two groups, depending upon whether the lesion was located above or below the diaphragm.

Nine procedures involved lesions above the diaphragm. Induction and intubation were performed with intravenous barbiturates and relaxing agents combined with topical anesthesia of the larynx and trachea. Nitrous oxide and oxygen in concentration of 75 per cent to 25 per cent were administered during the injections of the barbiturates and relaxing agent. Endotracheal ether was preferred for maintenance of anesthesia, since it allowed maximal oxygen concentrations in the anesthetic mixture and demonstrated considerable peripheral vasodilating effects. Respiration was assisted or controlled as seemed necessary.

Fluid replacement was managed through 2 or 3 15-gauge polyethelene catheters introduced into veins in the extremities. The cardiac action was monitored with an oscilloscope and a direct recording electrocardiograph.

Hypothermia was used on three occasions to help prevent spinal cord damage that resulted from ischemia during the period that the aorta was clamped. Chlorpromazine in moderate dosage was used as a pre-cooling medication in 2 of these cases, and effected some reduction in the time required to accomplish hypothermia. Temperature was monitored by a continuously recording thermocouple inserted into the rectum. Refrigeration was terminated at 87 to 85 degrees F., and the temperatures gradually dropped to 82 to 79 degrees F. by the time of operation. One patient was badly burned during a too rapid postoperative rewarming.

The second group involved 43 procedures upon vessels below the diaphragm. Spinal anesthesia was the technique preferred in these cases. The anesthetic solution consisted of 7.5 mgm. of dibucaine (nupercaine) and 75 mgm. of procaine plus .05 mgm. of epinephrine in a 5 per cent solution of glucose, with the total volume being 4 cubic centimeters. After the level of anesthesia was clearly established, the patient was sedated with small doses of an intravenous barbiturate, and a nitrous oxide-oxygen mixture (75 per cent to 25 per cent) was used for supplementation, ordinarily by means of a nasal catheter. The blood pressure was maintained by intermittent intravenous or intramuscular injections of ephedrine or methoxamine. Additional supplementation of anesthesia was accomplished by conversion to endotracheal ether anesthesia. Spinal anesthesia was preferred in the cases of the second group because early experience demonstrated that inhalation anesthesia could seldom accomplish the profound relaxation and quiet operative field so necessary for this type of operation.

Occasionally there was rather severe hypertension shortly after occlusion of the aorta. Treatment with ganglioplegic drugs or peripheral vasodilating agents was unsuccessful in lowering the blood pressure. There was a high incidence of premature ventricular contractions during the period of hypertension, occasionally requiring the use of cardiodepressant drugs such as procaine amide or quinidine.

Re-establishment of circulation in the occluded area invariably resulted in a profound drop of the blood pressure. The administration of 500 to 1,000 cubic centimeters of blood and the judicious use of vasopressor amines ordinarily restored the blood pressure to normal. Most of the drop in the blood pressure was believed to have been caused by the combination of leakage at the anastomotic site and the filling of the empty peripheral vascular tree.

The use of vasopressor amines in these cases requires special consideration. Circulation to the lower extremities is usually poor, and it is best that preparations such as ephedrine and methoxamine (vasoxyl) be used rather than the more profound vasoconstrictors such as

norepinephrine which may rather markedly depress blood flow through the extremities.

The postoperative care of these patients also requires special consideration. They should remain in the recovery ward for at least 24 hours, so that they may be near the operating room if there is postoperative hemorrhage. Also a large quantity of blood should be held in reserve for several days.

—*Robert P. Bergner, M.D.*

Comparative Experiments in Dogs on Circulation and Metabolism in Barbiturate Anesthesia with and Without Depression of the Vegetative Stimulus Transmission by Preceding Administration of Promethazine and Chlorpromazine (Vergleichende Kreislauf- und Stoffwechseluntersuchungen in Barbituratnarkose mit und ohne Daempfung der vegetativen Reizuebertragung durch Vorgabe von Promethazin und Clorpromazin am Hund). WOLFGANG IRMER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 283: 129.

THE AUTHOR reports on studies made on dogs to evaluate the influence of sympathicomimetic drugs and ice on the circulation and metabolism during anesthesia. These experiments make an important contribution to the physiology of anesthesia. They help to clarify the question of whether general anesthesia alone is sufficient to eliminate reactions to adrenergic stimuli, or whether pharmacologic depression with neuroplegic drugs in combination with general anesthesia is more effective.

A group of 5 dogs were anesthetized intraperitoneally by phanodorm and subjected to the stimuli of sympathicomimetic drugs and ice. Another group of 5 dogs received a combination of promethazine, chlorpromazine, and dolantin intramuscularly 1.5 hours before anesthesia with intravenous evipal was started. In this group sympathicomimetic drugs and ice bags also were applied during the anesthesia. The sympathicomimetic drugs used were a synthetic compound of the noradrenalin group and a drug named effortil. The pulse rate, respiratory rate, respiratory volume, oxygen consumption, hemoglobin, and arterial and venous oxyhemoglobin saturation were taken before, during, and after the administration of the drugs and the application of the ice.

Comparing the 2 groups, the author arrived at the following conclusions:

The amount of anesthetic necessary for deep anesthesia is markedly reduced in the animals which were pretreated with the neuroplegic combination. In this group 40.3 mgms./kg. of evipal were sufficient for deep anesthesia of more than three hours' duration, whereas in the group not given neuroplegic drugs 60 mgms./kg. were necessary for an anesthesia of only 6 to 25 minutes' duration.

The depression of stimulus transmission by the lytic cocktail prevents adrenergic reactions like vasoconstriction and the rise of blood pressure. The stabilization of circulation is maintained much better under the influence of the drugs, which is of special practical importance for the treatment of surgical shock. Vasoconstriction of the peripheral vessels, which puts an additional load on the left side of the heart, is promptly eliminated by the vasodilating action of chlorpromazine.

A histoplegic lowering of the basal metabolism rate was not observed. The lytic drugs alone do not cause a significant lowering of the rectal temperature. The neuroplegic combination caused a decrease of 23.2 per cent in the average of oxygen consumption in experiments on man.

A marked difference between the two groups existed in the regulation of respiration. Depression of the respiratory center is avoided under the influence of the lytic drugs, and a specific chlorpromazine action improves respiration. In ether anesthesia the excitative stage is avoided, sleep sets in more rapidly, and smaller amounts of ether are needed to obtain deep anesthesia.

The stress symptoms caused by adrenergic aggression are suppressed by the neuroplegic drugs. However, in contrast to Laborit, the author found that in man the eosinophil drop cannot be significantly changed by promethazine and chlorpromazine.

In the state of hypothermia the pharmacologic depression avoids the defense reactions of circulation and metabolism. In simple barbiturate anesthesia a marked rise of venous pressure was observed during the cooling process. These venous hypertensions could be avoided by pretreatment with the lytic combination.

Hyperglycemia caused by hypothermia was observed in both groups. It is assumed that this is caused partly by increased adrenalin secretion and partly by insufficient oxidation at low temperatures. The hyperglycemia disappeared when the animals were rewarmed.

The influence of low temperatures on the impulse formation and impulse conduction in surgery of the human heart under hypothermia demands an exact determination of the optimal temperature. Although it is possible to lower the temperature to 25 degrees centigrade under the protection of neuroplegic drugs, it is advisable not to go below 28 to 26 degrees in order to avoid the danger of auricular fibrillation.

—*Werner M. Solmitz, M.D.*

Hypothermia Control with an Improved Plastic Blanket. M. H. CASS. *Med. J. Australia*, 1956, 43: 509.

THIS ARTICLE describes an attempt to find an ideal method for applying cutaneous cooling to various sized individuals. The device and its use is pictorially presented. Its use on a number of patients of varying ages and weights is documented.

The device is in essence a plastic blanket through which large quantities of water can be circulated. Because of its large size and pliability it can be applied to an individual of nearly any dimension. This blanket is literally wrapped around the patient for induction of the hypothermic state. After sufficient cooling has been attained, the chest can be exposed by laying back a portion of the blanket while the remaining still ensheathes the patient for control of the hypothermic state.

Induction, maintenance, and rewarming can be accomplished with this device as efficiently as with multiple blankets. During the rewarming phase a sudden decrease in body temperature may be induced by the introduction of warmer water into the system. The mechanism allowing for this phenomenon is thought to be vasodilation with a loss of heat to a still present cool solution. With this device cooling, maintenance,

and rewarming can be accomplished with a minimum of disturbance. Ready access to the chest can be had in the event that ventricular fibrillation is induced during the cooling phase.

—*Richard L. Lawton, M.D.*

Exacerbation of Pre-Existing Neurologic Disease After Spinal Anesthesia. LEROY D. VANDAM and ROBERT D. DRIPPS. *N. England J. M.*, 1956, 255: 843.

THE SELECTION of proper patients for spinal anesthesia is of great importance. A well known contraindication is pre-existing disease of the central nervous system. While this is an established tenet, its support by documentation is incomplete.

Material for this report was obtained in a study of 10,098 spinal anesthetics and the patients selected for the anesthetics. In this series, spinal anesthesia was given to 11 patients with pre-existing neurologic disease.

Symptoms caused by a meningioma of the spinal cord began in the postoperative period following administration of spinal anesthesia. However, the diagnosis was delayed, and myelography was not done because it was felt that the patient was suffering from post-anesthesia arachnoiditis.

Two patients with viral disease of the central nervous system who had spinal anesthesia are discussed. In one, herpes zoster appeared 2 days after the administration of anesthesia. Neurologic sequellae involving the back and legs lasted approximately 2 weeks, and a subjective peripheral temperature differential was present 1 year later. The other case involving viral disease was a patient in whom mumps encephalitis had occurred 10 years previously. Symptoms that had been dormant for years apparently were exacerbated by the spinal anesthesia.

It should be emphasized that patients with degenerative diseases of the central nervous system may date the onset of such previously well established disease to an operation, trauma, or confinement. A case of this sort is presented in which a patient with a 6 year history of neurologic abnormality following a cerebrovascular accident had an increase in symptomatology following spinal anesthesia.

Three cases are presented which illustrate the recurrence of back pain and sciatica in patients who had had these symptoms previously. It is suggested that patients who have a history of backache be excluded from receiving spinal anesthesia. It is also suggested that spinal anesthesia not be used for operations on the back lest pre-existing pain and/or neurologic deficit following the operation be attributed to the anesthesia.

When tumor metastases are present in the spine at the time of operation the symptoms produced by such metastases may be ascribed by the patient and his physician to the anesthetic. Two cases of this type are presented; in one the diagnosis of adhesive arachnoiditis was refuted by the radiologist who found positive evidence of metastatic disease.

When spinal anesthesia is chosen for diabetic patients, as it often is, the possibility of existing neurologic disease, such as diabetic neuropathy, should be considered. When old age and vascular disease are added to the diabetes, the possibility of existing neurologic deficit is increased. Two cases are presented which indicate postoperative neurologic sequellae that may have been caused by any of the elements listed above.

While meningitis is not a great problem now that the importance of aseptic technique is established, it is thought that spinal anesthesia probably should not be used if infection, especially blood stream infection is present. In experimental animals, meningitis has been produced after occipital or lumbar puncture done within 5 hours of injecting pathogenic bacteria intravenously.

A case of meningitis that occurred 12 days after spinal anesthesia is presented. The presence of coincident, acute purulent otitis media complicated the picture.

The conclusions drawn from the study are that spinal anesthesia should not be given to patients with afflictions of the central nervous system or spinal column. This applies to congenital, healed, inactive, and active disease. It includes trauma, bacterial and viral infections, degenerative diseases, neoplasms, and systemic diseases with neurologic components. Exceptions may be made when other anesthesia is considered more hazardous.

—*John J. Bergan, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Practical Value of the Posteroanterior Roentgenogram and Roentgenoscopy in Certain Types of Heart Disease. ANDRÉ J. BRUWER. *Am. J. Roentg.*, 1956, 76: 664.

IT HAS BEEN STATED that the roentgenologist contributes about 10 per cent to the final diagnosis in cardiologic conditions. It probably would be more accurate to say that the amount of help he provides varies from case to case. That is, in some conditions the radiologist probably can make an entirely correct diagnosis by study of the posteroanterior thoracic roentgenogram alone, with his contribution, therefore, being a large one. On the other hand, in arriving at a definitive diagnosis of the more complex types of congenital heart disease, such as tricuspid atresia with transposition or persistent common atrioventricular canal, his contribution will be much smaller.

What is important, if the method is to be useful, is for the roentgenologist to confine his statements within the limits that may serve some practical purpose in a particular case. It is the author's opinion that when roentgenograms are used to illustrate certain types of heart disease, they should be used merely as a step in the diagnosis, and that only the pertinent features should be emphasized. For example, if a roentgenogram is used to illustrate an instance of atrial septal defect, the accompanying legend should stress, not the fact that what is shown is a roentgenologic example of an atrial septal defect, but such features as the pulmonary trunk, the vascularity of the pulmonary fields, and the appearance of the aortic shadow. These features may show a pattern commonly found in atrial septal defect. By correlation with other clinical and laboratory findings, the diagnosis is reached. To declare in a legend that a roentgenogram is that of, for instance, an atrial septal defect may be true, but is really somewhat deceptive. A similar roentgenologic picture may be seen in the presence of ventricular septal defect and persistent common atrioventricular canal, as well as in other conditions. But the significant findings in the roentgenogram will be those which lead part of the way to the diagnosis. In other words, there will be very few times when the roentgenogram will be characteristic of a specific diagnosis in cases of congenital heart disease. But there will be many occasions on which the roentgenogram will furnish one or several building blocks in the completion of the final diagnostic structure.

A study of the thoracic roentgenograms of many hundreds of patients who came to the Mayo Clinic suffering from the commoner types of acquired heart disease and certain types of congenital heart disease has been made. In all the cases considered, the condition was proved either at operation or at cardiac catheterization, or at both. In the study of these films it became apparent that much pertinent roentgenologic information can be obtained from a combined evaluation of the posteroanterior thoracic roentgenograms and roentgenoscopy of the hilar and peripheral pulmonary arteries. With few exceptions, other conditions under which roentgenoscopy may be of practical value are study of the size of the left atrium, detection of cardiac calcification, especially valvular calcification, and in right aortic arch and anomalous right subclavian artery. Occasionally, a ventricular aneurysm can be demonstrated roentgenoscopically.

The material presented in the complete paper has been restricted to those conditions in which it is felt that the roentgenologist can give either an unequivocal diagnosis, or to those in which he can offer a helpful contribution to the final diagnosis. No attempt was made to present any esoteric findings or to suggest findings that the examiner theoretically should be able to see, in view of a subsequent catheterization or necropsy. Therefore, no attempt was made to interpret complex cardiac anomalies as they appeared in roentgenograms.

Most of the roentgenograms that were analyzed pertained to adult persons and teen-age children. Yet some of the findings apply equally to roentgenograms of small children, although it is felt that accuracy of interpretation often is not as high when the patient is in the first few years of life as it is when the patient is in the teen-age or adult-age groups. As is well known among those who have dealt with roentgenograms of infants, it would not be surprising to find that, after a dozen roentgenograms of the thorax of one infant had been made in a single day, the heart has assumed different shape, and the lungs have exhibited a different degree of aeration in each roentgenogram. In most cases of congenital heart disease in babies, it is best for the roentgenologist to evaluate the pulmonary fields for evidence of the degree of vascularity, such as diminished vascularity in the presence of obstruction of the pulmonary or tricuspid valve, or increased vascularity in the presence of septal defects and transposition. Evaluation of hilar pulsations or of ventricular size in infants is often impossible or is done with foreknowledge of ambiguous results. In an infant who has a large, failing heart, a knowledge of whether or not the patient is cyanotic, together with the appearance of the pulmonary fields, will enable the examiner to categorize the lesion, leaving further investigation of the condition to the clinician and physiologist, perhaps with the help of more complicated roentgenologic procedures.

The features that have been regarded as valuable on the posteroanterior roentgenogram, other than among infants, include the following. First, the appearance of the shadow of the pulmonary trunk (the term "pulmonary trunk" is used when reference is made to that part of the pulmonary artery projected near the left main bronchus). Second, the appearance of that part of the aortic arch referred to as the "aortic knob." Third, the appearance of the branches of the pulmonary arteries as projected in the pulmonary fields. Fourth, the appearance of the border of the left side of the heart, according to whether it is more suggestive

of right ventricular or left ventricular enlargement. In the former it tends to be "straight," and in the latter, "hollow." Fifth, the appearance of the border of the right side of the heart, with special reference to the double auricular contour produced in mitral heart disease. Sixth, the presence of costophrenic septal lines which are excellent and accurate indications of increased pulmonary venous pressure, whether the increase is caused by mitral heart disease or left ventricular failure. Seventh, the appearance of the proximal portion of the descending thoracic aorta. Finally, the finding of notching in the ribs. For descriptive purposes, the prominence of some of these features was graded.

Conditions represented in this study are those related to congenital cardiovascular conditions and acquired heart disease. The following congenital cardiovascular conditions are included: atrial septal defect, ventricular septal defect, patent ductus arteriosus, pulmonic stenosis with intact ventricular septum, tetralogy of Fallot, coarctation of the aorta, right aortic arch, and anomalous venous connection of the lungs. Conditions of acquired heart disease discussed by the author are: mitral valve disease and aortic valvular disease.

A few brief notes are appended on a number of cardiovascular conditions in which posteroanterior roentgenograms of the thorax can either provide a positive diagnosis or guide the examiner to the correct ultimate diagnosis. These conditions include funnel chest, cardiac aneurysm, pericardial cyst, calcified pericardium, subclinical coarctation, pulmonary arteriovenous fistula, truncus arteriosus and, Ebstein's malformation of the tricuspid valve.

Congenital Mitral Stenosis; Roentgen Study of Its Manifestations. THEODORE F. HILBISH and ROBERT N. COOLEY. *Am. J. Roentg.*, 1956, 76: 743.

A REVIEW of the literature revealed that uncomplicated congenital mitral stenosis is extremely rare, and that even as a lesion accompanying some other defect, as for example a patent ductus arteriosus or an interventricular septal defect, it is decidedly uncommon. The authors had the opportunity to study 17 cases thought to represent instances of congenital mitral stenosis by roentgenologic means. Two of the conditions were proved by autopsy.

Pathologically, congenital mitral stenosis is quite similar to the acquired lesion in that it is often accompanied by some degree of insufficiency. This occurred in several of the authors' patients, although the stenosis continued to remain the predominant abnormality. The hemodynamic effects are not different from those observed in the acquired condition, except that they become manifest at an earlier age. In the uncomplicated case, there is an increased mean pressure in the left atrium, pulmonary veins, capillaries, arterioles, pulmonary artery, and eventually in the right ventricle and atrium. This sequence of events leads to dilatation, associated in some instances with hypertrophy of the left atrium, dilatation of the pulmonary vascular structures, with chronic passive congestion and intermittent attacks of edema, and finally to congestive heart failure. However, because of the relatively short duration of the disease and the comparatively healthy state of the atrial wall when first seen, marked dilatation of the left atrium is not as commonly observed in congenital mitral stenosis as in the acquired lesion unless some other major anomaly complicates the picture, as for example, coarctation of the aorta and patent ductus arteriosus.

In discussing the roentgenologic features the authors divide their cases into 5 groups which are classified according to the nature of the associated anomaly or defect. These groups are:

Group I. Mitral stenosis associated with a reverse flow through a patent ductus arteriosus (3 cases).

Group II. Congenital mitral stenosis with a patent ductus arteriosus without a reverse flow (3 cases).

Group III. Congenital mitral stenosis associated with coarctation of the aorta (6 cases).

Group IV. Mitral stenosis with probable interventricular septal defect (2 cases).

Group V. Uncomplicated congenital mitral stenosis (3 cases).

Brief résumés are given of the histories of the individual patients, and the salient roentgen findings are illustrated with reproductions of beautiful conventional roentgenograms, angiograms, and schematic line drawings.

In 2 of the cases in which autopsy was done the roentgen findings were confirmed beyond doubt. In 14 of the 15 presumptive cases there was evidence of appreciable left atrial enlargement as revealed by conventional roentgenologic examination. All 15 patients underwent angiocardiography, and in every patient there was stagnation of the contrast medium within the left atrium. In 10 of the 15 patients cardiac catheterization was done, and this revealed increased pressure in the pulmonary artery in 9. In one patient operation was performed for coarctation of the aorta and the dilatation of the left atrium was confirmed.

Although the authors admit that in those patients who did not have autopsy the diagnosis of mitral stenosis was not fully substantiated, they nevertheless are of the opinion that a presumptive diagnosis can and should be made by modern roentgenologic procedures prior to death, since early and skillful cardiac surgery in these children may afford an opportunity of prolonged and useful life. —*T. Leucutia, M.D.*

Closed Loop Obstruction of the Afferent Limb; a Late Complication of Antecolic Partial Gastrectomy. N. HAJDU, M. A. HARRIS, and GORDON S. RAMSAY. *Brit. J. Radiol.*, 1956, 29: 418.

THE ORIGINAL POLYA RESECTION of the stomach not infrequently was followed by mechanical obstruction of the anastomosing loop, so that eventually it was replaced by the posterior retrocolic and then by the anterior antecolic approach. It was assumed that with the latter operation mechanical obstruction would not occur. However, during the past few years several articles have appeared in the surgical literature pertaining to acute obstruction of the afferent loop following antecolic partial gastrectomy.

In the present article the authors review 23 cases of afferent loop obstruction and describe in detail the roentgen findings in 2 cases observed personally. Roentgenographic reproductions, sketches, and diagrams are used for the illustration of the pertinent points.

From a study of the available cases they distinguish three types of obstruction: (1) obstruction occurring as a result of small intestinal herniation through the gap between the anastomosis and the transverse colon, either from right to left or from left to right (10 cases); (2) obstruction caused by volvulus, kinking, or strangulation of the afferent loop when a long afferent loop attached to the lesser curvature of the gastric stump is present and this has moved behind the efferent loop (12 cases); and (3) obstruction from constricting bands, local postoperative adhesions, or traction and misplacement of the greater omentum (1 case). One of the authors' cases belongs to group 2 and the other to group 3.

The obstruction occurs either during the postoperative period or later, up to 12 years following the original operation. The clinical picture is identical, except that operative delay is more apt to prove fatal during the early phase of the complication. The onset is sudden and stormy with continuous epigastric pain, vomiting, the absence of bile from the vomitus, shock, and prostration. The clinical signs are indefinite and may account for the high mortality rate (44 per cent) of the reported cases. Roentgenologic examination was performed in only 5 of the 23 cases and appeared contributory to the diagnosis in 2.

The authors, after study of the findings of the roentgenologic examination in their 2 cases, believe that this examination is of very definite value. The most characteristic roentgen sign is the demonstration on the plain roentgenogram of a "pseudotumor" in the upper abdomen in the absence of pathologic fluid levels. If this finding is assessed in the light of history, symptoms, and clinical picture, the correct diagnosis should be forthcoming without difficulty.

—*T. Leucutia, M.D.*

The Significance of Aortography for the Diagnosis of Abdominal Aortic Aneurysm (Die Bedeutung der Aortographie fuer die Diagnostik der abdominalen Aortenaneurysmen). G. Aurig and H. Radke. *Fortsch. Roentgenstrahl.*, 1956, 84: 661.

The aortographic studies of 6 instances of aneurysm of the abdominal aorta are reported by the authors in their desire to add to the still inadequate clinical and documentary records of this subject. The puncture of the abdominal aorta was in every instance carried out at the level of the twelfth dorsal vertebra with the attempt, as a rule, to enter the aorta below the level of the celiac axis. When this was not successful, no attempt to withdraw the needle and make a second lower puncture was made, since the loss by dilution of the contrast material at the higher level was not considered so great as to justify the added danger of a second puncture. All punctures were subdiaphragmatic.

The first patient was a 60 year old male with a fist-sized pulsating mass at the level of the umbilicus. The aortographic exposure disclosed a conical narrowing of the aorta from the level of the eleventh dorsal vertebral to a level immediately below the origin of the renal arteries, where it widened irregularly to twice its normal size. Succeeding exposures disclosed evidence of extensive thrombotic deposits and a more complete and vigorous filling of the right iliac artery. The last exposure of the series (taken 20 seconds after the first) demonstrated a marked slowing of the blood stream. This spindle-shaped aneurysm was placed among the category of true aneurysms.

The second patient was a 68 year old male, who suffered from angiospastic attacks. Aortography disclosed an apple-sized, irregular aneurysmal shadow partially overlapping the aortic bifurcation. Its form caused it also to be considered a true aneurysm. The large vessels of the pelvic region showed no changes, but the condition could not be distinguished definitively by means of aortography from a false aneurysm.

The third patient was a 53 year old male. Aortography disclosed a double fist-sized aneurysmal sac which extended toward the left side, thus crowding the arterial branches above it (celiac axis, superior mesenteric artery, and left renal artery) closely together. The left kidney was displaced upwards and its function impaired. The contrast material showed damage to the walls of the aorta proximal to the branching of the renal arteries. The splenic vein remained demonstrable more than 10 seconds after the injection. The abdominal aorta from the level of the renal arteries to the abdominal bifurcation was abnormally long.

A similar finding in a 65 year old male with a palpable, pulsating mass in the upper abdomen, who suffered from ischemic pains and intermittent claudication, was not documented in this report.

The fourth patient was a 74 year old woman with a pulsating mass in the region of the navel, and with cardiac insufficiency symptoms and ischemic pains in the left lower extremity. The broad band of the aorta was bowed to the left as far as the level of the upper pole of the left kidney. It then shifted back to its normal position as a widened shadow with irregular outlines. The widening continued in moderate degree into the iliac arteries where, on the right side, the lumen of the artery suddenly ended. There was also retardation of the blood stream in the aneurysmal vessels (up to 16 seconds).

The fifth case was that of a 63 year old male. The widened aorta, below the branching of the renal arteries, deviated in a right angle to the left and then returned to its normal position. The trajecture was still longer than normal, since the bifurcation was at the level of the first sacral segment. The shadow represented a cylindrical aneurysm with peripheral dilatation extending into the iliac vessels. The widened lumen seemed to rule out the presence of a dissecting aneurysm, and the most likely diagnosis seemed to be that of a true aneurysm.

The authors regret that they have not the means to procure cinematographic exposures. With exposures at 5 second intervals they must infer what happens in the interval between one roentgenogram of the series and the next. They believe they have demonstrated the value of the method in the diagnosis of aneurysm of the abdominal aorta, and that aortography fulfills all the demands required from roentgen examination. Its findings constitute a pathoanatomic and a pathophysiologic picture which can serve as a basis for the planning of therapeutic measures.

—*John W. Brennan, M.D.*

The Results of Radiotherapy of Bronchial Cancer. L. H. GARLAND and M. A. SISSON. *Radiology*, 1956, 67: 48.

OF 623 PATIENTS with a diagnosis of bronchogenic carcinoma at the San Francisco Hospital, 144 were accepted for definitive treatment. The remainder were inadequately documented, were given supportive treatment, refused treatment, or the tumor was first found at autopsy. Of the 144 hospital patients, 67 were treated by radiotherapy alone and 16 received radiotherapy after exploratory surgery. The study also includes 41 private patients who were referred for radiotherapy; all were inoperable or had refused operation.

The patients receiving radiotherapy were divided into 3 groups. The first group was given a palliative course of less than 1,500 roentgens tumor dose in 4 weeks, the second a moderate course of 1,500 to 3,000 roentgens in 4 weeks; and the third a more radical course of over 3,000 roentgens in 4 to 6 weeks.

About 60 per cent of all the patients treated obtained relief of cough and pain. Of those receiving more than 1,500 roentgens, 80 per cent obtained relief.

No consistent correlation was discovered between the type of tumor treated and the average survival time. The average survival following radiotherapy for all cases was 5.3 months. In general the shorter the duration of symptoms, the shorter also was the duration of life after the onset of symptoms.

The authors lean toward moderate rather than radical dosage. If the disease is limited in extent and at all radiosensitive, moderate dosage will achieve as much as heavy dosage in the majority of cases; if it is neither limited nor radiosensitive, no tolerable radical dosage will be of significant benefit. Patients in poor general condition or with distant metastases should not be subjected to radical radiotherapy. The patients will benefit at least psychologically from judicious radiotherapy and many symptoms will be relieved; for a few, survival will be increased. The authors judge, from the reports of megavoltage therapy to date, that the results of orthovoltage are of about the same order in effectiveness for bronchial cancer. They suggest that greater use should be made of the generally available orthovoltage roentgentherapy in the care and treatment of inoperable bronchogenic carcinoma. —*Lois Cowan Collins, M.D.*

MISCELLANEOUS

Recent Conclusions from the Study of Radiation Genetics (Neuere Ergebnisse der Strahlengenetik). H. FRITZ-NIGGLI. *Fortsch. Roentgenstrahl.*, 1956, 85: 265.

THE AUTHOR has been using the eggs of the fruit fly (drosophila), for a comparative study of the radiations from a 23-megavolt betatron and an 180-kilovolt roentgen apparatus. He has calculated the rate of mutation of the Drosophila melanogaster as compared with the theoretic rate for the human being as 1 to 11.6.

The author finds that the time at which radiations are applied has something to do with the rate of mutation, at least in so far as the lethal rate is concerned. When the male of the fly is given 3,000 roentgens from a 180-kilovolt apparatus on the fifth to the seventh day before mating the number of eggs that hatch drops to 20 per cent.

The rate of mutation of the fly and the hardness of the ray do not differ greatly whether the source of radiation is the betatron or the roentgen apparatus.

The author concludes there is no threshold below which the radiations do not produce mutations, and that the mutations represent irreversible injuries.

There has been no determination of the relationship between the type of ray and the type of mutation. There is some indication that a difference in the mutation type is related to the amount and density of the ionization employed. The author finds that with reference to the recessive sex-bound lethal factors in the drosophila a dosage of 1,500 roentgens produces 80 per cent of the so-called point mutations and 20 per cent of mutations with changes of the chromosome structure; with 4,000 roentgens the percentages are exactly the reverse.

The production of mutations by radiation seems to have something to do with the environment. In an environment of high oxygen content mutations are favored, in one of low oxygen content mutation does not occur except indirectly.

The author concludes that the different stages of the male sex cells of the drosophila vary in their resistance to the ionization rays. The spermatocytes and the spermatogonia are the most resistant; the sperm cells and the spermatids are relatively radiation sensitive; but they differ markedly from one another and in their reaction to the oxygen content of their environment. —*John W. Brennan, M.D.*

Irradiation—Carcinogenesis and Protection. JAMES J. NICKSON. *Med. Clin. N. America*, 1956, 40: 647.

THE AUTHOR briefly reviews our knowledge of the carcinogenic effects of ionizing radiations and the reasons for avoidance of unnecessary exposure to them.

The kinds of ionizing radiation of concern to us are almost bewildering in their complexity, and range from those of interest only because they contribute to the environmental level of exposure, to the old familiar diagnostic x-rays.

Electromagnetic radiations have a combined electric and magnetic field which affect the atomic structure of matter when they dissipate the energy.

Corpuscular radiations consist of streams of various kinds of atomic or subatomic particles. Energy is transferred to anything they strike.

Cosmic rays are a complex admixture of electromagnetic and corpuscular radiations. They are of interest to us only in assessing the amount of background radiation received by everyone.

The energy associated with any of these kinds of radiation may vary. X-rays, for example, may be emitted with only a few electron volts of energy or they may be generated at hundreds of millions of electron volts of energy. In the first instance a sheet of paper will absorb them. In the latter instance they will penetrate several feet of armor plate. Medically, x-rays are used whose energies range from a few thousand to several million electron volts. The sources of exposure to radiation can be broken down to environmental, occupational, and medical exposures.

The first cancer known to have been caused by these rays was a skin cancer, observed in man 5 years after discovery of x-rays. Subsequently many such lesions were reported in individuals who have been exposed to x-rays. Cancer of the skin in physicists, physicians, technicians, and nurses has been frequently described. Cancer of the lung has been described in miners of the Joachimsthal and Schneeberg mountains, in mines which are currently worked for their uranium ore. Osteogenic sarcoma has been reported in radium dial painters and in patients given large doses of x-rays. In the experimental animal the number of sites of origin of radiation-induced cancer is almost identical with a listing of the normal tissues.

Leukemia, both in man and in laboratory mammals, has been one of the most frequent neoplasms induced by radiation.

Ovarian tumors in the mouse may be produced with relatively small amounts of radiation and are an example of radiation producing a hormonal imbalance which then is the more direct instigator of ovarian tumors. Gardner showed the carcinogenic effect of hormonal imbalance in the mouse, utilizing unirradiated ovaries transplanted to the spleen. The transplanted ovary continues to produce estrogens but these are removed from the circulation by the liver. The pituitary, lacking the usual check on follicle-stimulating hormone (FSH), overproduces that hormone leading directly or indirectly to the development of a cancer in the ovary. An analogous hormonal situation exists for the irradiated ovary. Here the ovarian production of estrogens ceases, follicle-stimulating hormone levels increase, and ovarian cancer eventuates. Injection of estrogen will abolish the high incidence of ovarian cancer following transplantation. If only one ovary is irradiated, no tumor develops, nor does a cancer develop if the irradiated tumor is transplanted to a normal female mouse.

The maximum permissible exposure or recommended level of occupational exposure to ionizing radiation currently is set by the International Committee of Radiation Protection at 0.3 roentgens (300 mr.) per week. Libby has recently summarized the total yearly milliroentgen exposure of the average individual to be 340, which is approximately one-third a roentgen.

Exposure of physicians who are not radiologists today is limited practically to that from diagnostic x-ray equipment. To a lesser but increasing degree the use of radioisotopes in medicine also constitutes an exposure hazard. Detailed knowledge of the levels of exposure received by nonradiologists operating x-ray machines is lacking. In diagnostic exposures protection is obtained by a partition of appropriate construction between the control panel and the x-ray machine. Fluoroscopy is much more difficult. The degree of fluoroscopic exposure is minimized by utilizing the smallest feasible fluoroscopic field, the wearing of protective lead-lined aprons and gloves, and by the avoidance of unusual fluoroscopic procedures.

At the present time the use of radioactive isotopes as diagnostic tools is limited, but it is certain that it will greatly extend during the next decade. The physician using artificial isotopes must acquaint himself with the approved method of handling them. The patient's exposure to x-rays during diagnostic and fluoroscopic procedures is a problem which can be taken care of satisfactorily. X-rays and radioactive isotopes are valuable as diagnostic tools which must be handled with care. —*Frank L. Hussey, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Congenital Deformities in Man; View of Modern Pathology (Die angeborenen Missbildungen des Menschen in der Sicht der modernen Pathologie). FRANZ BÜCHNER. *Deut. med. Wschr.*, 1956, 81: 1341.

DURING THE PAST 15 years increasing emphasis has been placed on the environment of the developing embryo as a cause of human congenital deformities. Experiments carried out by the author and reports in the literature prove that transient lack of oxygen or glucose may result in congenital anomalies.

Biochemical studies, though incomplete, indicate that intensive protein synthesis and increased respiratory processes precede structure formation. Stated differently, there is a latent period between chemical differentiation and morphologic changes in the embryo. Hence interference in the metabolic processes of certain embryonal regions will of necessity involve changes in the organs originating from that area.

The two basic mechanisms affecting embryonal metabolism adversely are a lack or insufficiency of catalytic processes caused by defective genes and exogenous factors affecting the embryo in certain phases. Thus damage may be produced by a rise in temperature which goes above the optimal for the organism, lack of oxygen, sugar insufficiency, poisons (particularly of the stimulating variety), and virus diseases (rubeola). Avitaminosis, a proved factor of damage in animals, requires further proof in man.

Damage via either mechanism produces identical results (phenocopy) and may be confined either to a single organ, to many organs, or their parts.

—*Sidney Smedresman, M.D.*

Some Observations on the Strawberry Nevus of Infancy. THOMAS S. WALSH, JR., and VICTOR N. TOMPKINS. *Cancer*, Philadelphia, 1956, 9: 869.

DURING the 5 year period ending December 1954, the authors studied 192 infants with 281 strawberry nevii. Although generally regarded as a congenital lesion present at birth, none of the lesions in this series was detected at birth. As a matter of fact, during 1 year not one strawberry nevus was detected among 4,892 newborns despite the promise of a reward for such identification. Subsequently 77 of these children were found to have a strawberry nevus. Thus the authors strongly believe that the lesion is not present at birth but comes to light about 7 to 10 days after birth. Only one made its appearance after the age of 6 weeks. They usually reach maximum size at the age of 8 months. If untreated, the majority undergo spontaneous involution with loss of the crimson color and diminution in size till entirely gone at about the age of 5 years.

The position of the single "feeding" artery almost invariably in the center of the lesion was ascertained in the 9 lesions that had surgical exploration (either excision or arterial ligation). Often the artery is a normally present subcutaneous vessel described in the standard textbooks. The size of the lesion does not always correlate with the luminal diameter of the feeding artery.

Solid carbon dioxide or dry ice was the treatment employed in 131 lesions. Because of frequent ulceration and infection the dosage was finally reduced to 2 doses of 3 seconds each. With this program there was only superficial peeling of the skin and no ulceration. Cryotherapy however, failed in 29 instances, usually because the lesion was more than 5 millimeters in thickness or because it was fed by a substantial subcutaneous artery.

One hundred and sixteen patients received a sclerosing injection; 1 per cent sodium tetradecyl sulfate was preferred to sodium morrhuate. With a 27 gauge needle the injections of 0.2 to 0.3 milliliters were aimed at the central artery. The position of the artery was deduced from the known anatomy of the area. Infection with ulceration occasionally followed direct intravascular injection. A preinjection application of dry ice for 3 seconds, however, was found to sufficiently "thicken" the skin to preclude this complication. Injection therapy proved effective in all but 4 cases. It is thought that the efficacy of this form of treatment is due to an interruption of the blood supply either by actual intravascular injection and thrombosis or by perivascular infiltration.

Accompanying the article are excellent photomicrographs illustrating the various phases of hypertrophic hemangiomas, which is the descriptive name applied to the lesion by pathologists. Cellularity is the prominent feature in the younger patients. With time, a fat replacement occurs, producing an appearance which closely simulates that of an angiolipoma. Mature lesions are characterized by dilated vessels which give way to perivascular fine fibrosis and, on occasion, to extensive necrosis.

—*Everett Shocket, M.D.*

Skin Sloughs Associated with Levophed; Pathogenesis, Prevention, and Treatment. JOSEPH T. MCGINN and JOSEPH SCHLUGER. *Am. J. Surg.*, 1956, 92: 594.

LEVARTERENOL (levophed) is a powerful vasopressor which, when administered in a slow intravenous drip, is a useful means of combating hypotension by causing generalized vasoconstriction with little or no decrease of cardiac output. The chief drawback in its use has been necrosis of the overlying skin when the solution accidentally extravasates. Furthermore, in lower limbs whose arterial supply is already impaired skin necrosis has been reported at sites distant from the point of infusion along the course of the involved vein without demonstrable extravasation.

The authors have observed 12 cases in which gangrene from extravasation occurred, as well as others with decided skin changes without the development of frank gangrene. Most cases of slough occur in the lower extremities, although it does occur elsewhere as well. It would seem advisable, if possible, to avoid the leg veins as sites for infusion, since the legs so fre-

quently show evidence of circulatory disturbances which reduce total blood flow and the rate at which levarterenol leaves the area. When necrosis occurs at a distance from the site of infusion, and without gross extravasation, the culpable factor is probably vessel ischemia caused by stasis and by spasm of the vasa vasorum with increased vessel permeability and consequent seepage into adjacent tissues.

A single injection of levarterenol does not cause necrosis. Necrosis seems to be a factor of the duration of exposure rather than the amount or strength of the solution.

Four of the authors' patients had accidental extravasation of levarterenol into the subcutaneous tissues which lasted at least a half hour. In every case, phentolamine (regitine), an adrenolytic compound physiologically antagonistic to epinephrine and norepinephrine (levarterenol, levophed) was infused into the affected area. Five milligrams of regitine in 10 cubic centimeters of normal saline with 125 turbidity-reducing units of hyaluronidase were employed, and in each case necrosis and slough were prevented. In no instance was an undesirable hypotensive effect noted in the patients treated.

The authors report a study in which they were able to prevent skin necrosis in rabbits that had been given subcutaneous infusions of levarterenol. Each of the protected rabbits was given 5 milligrams of phentolamine in 15 cubic centimeters of normal saline with hyaluronidase. These investigations demonstrated that the infiltration of levarterenol into the subcutaneous tissues can produce necrotic changes in the skin, and that necrosis can be prevented by the injection into the same site of phentolamine (regitine).

—*Sheldon Oscar Burman, M.D.*

Skin Necrosis Following Intravenous Use of Norepinephrine; Report of 6 Cases. RICHARD A. SHAPIRO and SAMUEL PERLOW. *Am. J. Surg.*, 1956, 92: 566.

NOREPINEPHRINE is widely used in the treatment of shock and peripheral circulatory collapse. It is usually administered intravenously in a concentration of 4 micrograms per cubic centimeter of an isotonic solution (4 milligrams per 1,000 cubic centimeters of solution) at an initial rate of 40 to 50 drops per minute. The chief complication of this therapy is intense local vasospasm and skin necrosis which occurs not infrequently. The authors report 6 such cases of skin gangrene from the Michael Reese Hospital in Chicago, Illinois.

The authors report a study in which, after ligating a canine femoral vein and injecting norepinephrine below the site of ligation, demonstrable vascular changes in the paravenous tissues occurred. These studies seem to indicate that perfusion of norepinephrine solution through an undamaged vein wall is conceivable under conditions of stagnation and sluggish circulation, such as is present in shock.

To combat the often severe venospasm occurring with intravenous infusion of norepinephrine, the authors recommend slowing the rate of infusion, temporarily substituting a nonpressor solution, especially a small amount of procaine, and also the application of warm compresses.

—*Sheldon Oscar Burman, M.D.*

Fat Embolism; The Amount of Fat in Human Long Bones. LEONARD F. PELTIER. *Surgery*, 1956, 40: 657.

THE AUTHOR lists his reasons for believing that the origin of fat emboli that accompanies bone trauma must be the local site of injury. After critically reviewing data previously recorded in the literature of other investigators who concluded that the amount of fat contained in the human femur was insufficient to cause clinically evident fat embolism, he presents data of his own to support his stand.

The total amount of fat contained in human long bones was determined by extracting the entire bone with alcohol and ether. The major amount of bone fat was contained in the metaphysial sponge rather than in the diaphysial tube. The quantities obtained were greatly in excess of those obtained by calculation, previously stated in the literature.

—*J. Herman Mahaffey, M.D.*

Soft Tissue Sarcomas of the Extremities and Trunk; a Clinical and Pathologic Study. M. V. SIRSAT. *Ind. J. Surg.*, 1956, 18: 251.

THIS PAPER consists of a detailed clinicopathologic and statistical survey of 146 patients with soft tissue sarcomas of the extremities and trunk who were treated in Bombay, India, between 1941 and 1954.

Fibrosarcoma was the most common variety and included 88 cases or 60 per cent of the total number of sarcomas. This tumor typically occurs in the fairly young age groups, with the average age in this series being 38.8 years. Sixty-three of the 88 cases were in males. The fibrosarcoma was most commonly located on the lower extremities (51 per cent). Because of its slow painless growth, the average duration from onset until medical observation was 3.5 years. A local recurrence after treatment was noted in 54.5 per cent of the patients. Usually the recurrent growth showed a higher grade of malignancy, Metastases was infrequent, occurring in only 17 patients.

Rhabdomyosarcoma was the next most common sarcoma. In this series there were 30 cases (20.5 per cent). It occurred at all ages with 40 per cent occurring between the ages of 51 and 60 years. There was a definite predilection for the lower extremity (50 per cent). The slow growth resulted in an average duration of symptoms of 16 months. Recurrence in these cases was noted in 15 patients (50 per cent). One-third of the patients showed metastases at the time of admission, usually to the lungs.

The remaining 28 cases of soft tissue sarcoma were divided among the more rare types of tumors. These were (in order of frequency): liposarcoma (7), reticulum cell sarcoma (6), angiosarcoma (5), synovial sarcoma (4), myxosarcoma (3), malignant granular cell myoblastoma (1), malignant nonchromaffin paraganglioma (1), and extraskeletal osteogenic sarcoma (1).

In each variety of sarcoma the gross and microscopic characteristics, as well as a review of the literature as pertains to that variety, is presented. In the extremely rare varieties case reports are presented.

The authors discuss the various theories of histogenesis of the sarcomas and also point out the variety of differential fiber stains which are occasionally required to subclassify these sarcomas.

It is noted in the 103 cases followed that despite the high (70 per cent) rate of recurrence the tumor was fatal to the patient in only 29 instances (28.1 per cent).

In 91 patients excision was the primary treatment, but obviously it was inadequate in view of the high recurrence rate. —*Arthur M. Simpson, M.D.*

EXPERIMENTAL SURGERY

Comparison of Positive and Alternating Pressure in Respiration Experiments on Animals (Vergleich von Ueberdruckbeatmung und Wechseldruckbeatmung im Tierexperiment). H. Hörnicke and J. Stoffregen. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 283: 185.

The authors report quantitative data supporting the theory that alternating positive-negative pressure in artificial respiration is more advantageous than intermittent positive pressure. Large dogs under morphine-pernoctone anesthesia and a tank respirator were used in the experiments. Positive, then alternating pressure was applied to the same animal and the changes in arterial blood pressure, blood supply of the lungs, and the rate of gaseous exchange were noted.

Under positive pressure the arterial blood pressure in an anesthetized animal with intact circulation usually does not fall below the compensation limit (100 mm. Hg.). In such cases alternating pressure effects a rise in blood pressure. If the initial blood pressure falls below 100 mm. Hg., alternating pressure is ineffective. Positive-negative pressure increases the blood supply of the lungs by increasing the stroke volume without changing the pulse rate. In patients in whom the regulation mechanism of the vasomotor system is disturbed by curarization or blood loss the positive-negative pressure alone can maintain a sufficient circulatory function. Furthermore, the alternating pressure increases the gaseous exchange rate mainly by increasing the respiration volume.

If artificial respiration is administered over a long period of time, the use of positive-negative pressure is advisable unless a low blood pressure is specifically required, in which case positive pressure in combination with ganglion blocking drugs should be used.

—*Victor R. Jablokow, M.D.*

The Replacement of Gastric Mucosa with Autogenous Skin Grafts. Edward A. Free, Henry Mannix, Jr., and John M. Beal. *Surgery*, 1956, 40: 554.

Believing that an operation which directly attacked the secretory epithelium of the stomach but did not alter the capacity, motor function, and pyloric sphincter mechanism would more nearly answer the problem of peptic ulcer, the authors set out to remove the gastric mucosa and replace it with autogenous skin grafts.

Fourteen dogs were used and 9 of these survived the operation. The skin grafts were .008 to .010 inch in thickness. They were secured to the muscularis mucosa after removal of the mucosa. A balloon was inflated within the stomach in an effort to maintain pressure against the graft. Specimens from the grafted areas were obtained at intervals ranging from 3 to 11 weeks following the original operation.

In 4 of the animals, 1 per cent of the graft was viable. In the other 5, 25 to 80 per cent of the graft was viable. Microscopically, there was little evidence of inflammatory reaction; there was an abrupt transition between epidermal and gastric mucosa, and there was muscularis mucosa immediately beneath the stratified squamous epithelium.

In the first 4 animals the grafts were cut at .020 and .025 of an inch. One to 2 millimeter subepithelial cysts were found which showed hair follicles, sebaceous glands, and sweat glands, histologically. Thinner grafts did not show these cysts.

While it was shown that autogenous skin grafts could be grafted upon the denuded gastric wall, certain difficulties were evident. Prevention of motion in order to allow the transplant to adhere firmly proved to be the greatest problem. Prevention of hematoma formation beneath the graft was less of a problem than had been anticipated.

Although it will be necessary to assess the resistance of the grafts and their ability to survive in the gastric lumen, the success achieved in one animal by 80 per cent viability of the graft is encouraging.

—*John J. Bergan, M.D.*

The Effects of Pedicled Grafts of Jejunum in the Wall of the Stomach; Long Term Follow-Up Study. S. W. Moore. *Ann. Surg.*, 1956, 144: 152.

A procedure was described in 1943, based on certain experimental evidence, whereby a graft of jejunum was implanted into the stomach wall with the expectation that the graft would exert inhibiting influences on peptic secretion and would favorably affect peptic ulcer disease. This report describes the clinical courses of 11 patients in whom the operation was performed.

There were 2 deaths following the operations. In 7 patients the ulcer disease continued or became worse. Within 3 years gastric resections were performed in 5 of these 7 and all 5 have been well since the resections. A sixth patient died with ulcer symptoms 3.5 years after the graft was placed. The seventh patient lives with continued symptoms and roentgenographic evidence of ulceration.

One patient has been free from symptoms for 12 years. Another is relieved of symptoms by medication.

In 4 patients, either at later operations or autopsies, the jejunal graft was found to be inflamed or ulcerated.

—*Leonard D. Rosenman, M.D.*

The Experimental Use of Skin Autografts Intraperitoneally. W. W. Armistead. *Plastic & Reconstr. Surg.*, 1956, 18: 9.

In the experiments described in this article, squares of full-thickness skin, split-thickness skin, and derma were applied as autogenous "patch" grafts to the outer surface of the intestine or urinary bladder. In some cases the grafts were applied to intact serosa; in others, squares of serosa were dissected off and replaced with the grafts. The animals were sacrificed at varying intervals after operation and the grafts were studied grossly and microscopically. As this study was concerned with the feasibility of intraperitoneal skin grafting in veterinary surgery, animals of six different domestic species were used. For economic reasons, a large share of the experimental surgery was performed on dogs. However, intraperitoneal skin grafting operations were also carried out on cats, horses, goats,

calves, and pigs. By studying in detail the results of operations on the dog, much basic information concerning the behavior of skin grafts in the peritoneal sac was acquired. By including a number of other species in these studies, information directly transferable to general veterinary practice was obtained.

When full-thickness grafts were used, the donor skin was removed by simple dissection with an ordinary scalpel after careful presurgical skin preparation. Donor skin was subjected to no special treatment after removal except being covered with moist gauze to prevent drying until it was sutured into place at the new recipient site. The time lapse between removal of the donor skin and its application to the recipient site varied between 10 and 30 minutes. The reason for this considerable variation was that, in any one animal, all the donor skin was removed at one time even though several grafts were to be applied. Microscopic study of the grafts on the third and seventh postoperative days suggested that this time lag produced no significant deleterious effects on the skin. The simple technique used for removing, transferring, and applying these skin grafts therefore is thought to have been satisfactory.

Throughout this study full-thickness grafts placed on the outer surfaces of the intestine or urinary bladder were applied with the derma against the viscus and the epidermis outward. It was believed that circulation of blood from the graft bed would be more promptly re-established through the derma than through the denser, cornified epithelium.

Transplantation of free skin autografts to intraperitoneal sites can be accomplished without elaborate equipment. Full-thickness skin, split-thickness skin, and dermal grafts can be transplanted to the outer surfaces of the intestine and urinary bladder with the expectation that they will survive in the vast majority of cases. The sebaceous glands in the buried skin grafts first undergo enlargement; later they atrophy and disappear. In most cases the disappearance occurs by the third month after transplantation. Autogenous skin transplanted into the peritoneal sac gradually loses its hair follicles and glandular elements but does not metaphase into a different kind of tissue. As a rule, buried epidermis undergoes moderate thickening of the Malpighii stratum and a gradual loss of pigment. Grafts transplanted into the peritoneal sac probably derive much of their early nourishment from the peritoneal fluid. During the first 2 weeks following transplantation of skin to an intraperitoneal site, connective tissue arises from the viscus wall surrounding the graft and completely covers the graft. This connective tissue covering usually becomes attached to a piece of omentum but it does not become attached to the epidermal surface of the graft. In most instances the omentum becomes attached over and around the grafts, but it does not seem to interfere with either the development of the grafts or the function of the underlying viscera.

The dermal side of the skin appears to have a hemostatic property which makes it an ideal material to control hemorrhage in, and to repair wounds of, highly vascular internal organs such as the spleen, liver, and kidney.

Significant hair growth does not occur and therefore should not be considered as a deterrent to the use of skin on the inside of the abdominal cavity.

—Ely Elliott Lazarus, M.D.